RAILROAD GAZETTE

FRIDAY, JUNE 12, 1896.

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Contributions.

The Compressed Air Motor and Dust.

NEW YORK, June 5, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in your last issue the short editorial on the compressed air motor for street service, and I am somewhat surprised at the position which you take. I cannot understand how facts can bear you out in the conclusions arrived at with regard to the effect of dust on the working parts. I have been frequently riding backwards and forwards on the New York Central in the last two or three years and have noticed the dumping of the gravel ballast along the line of their road in large quantities, where the passage of the trains caught up the dust and scattered it over the locomotive works and the axles and trucks of trains; indeed, it was so thick in many cases that the inside of the coaches were suffocating, and yet those engines have run for years and years and made time with their trains.

Now here is a motor that has been in frequent service for more than a year and a half running up and down on the dusty tracks of the New York Central, and I am told there has not been a dollar's worth of repairs put on it except in brake shoes; and if for any reason dust should gather and do any injury to the parts (which prominent mechanical men advise me it will not do with this motor), then it is not going to be a serious matter to have all of this apparatus encased to prevent the dust from getting in. S.

The Electric Grass Killer.

Illinois Central Railroad Company,
EAST ST. LOUIS, May 31, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have yours asking for information regarding the electric grass killer which was experimented with on this road, in answer to an inquiry by a Guatemala correspondent.

The electric weed killer referred to is evidently the machine with which some experiments were made on the Yazoo & Mississippi Valley Railroad under my direction some time since. The inventor is Capt. A. A. Sharp, of Memphis, Tenn., Superintendent of the New Orleans Division of the Yazoo & Mississippi Valley Railroad. This apparatus has only been used in a small way experimentally. It consists roughly of a wire brush about 10 ft. long and 4 in. wide, suspended by a frame from the end of a flat car, on which was placed a dynamo, the necessary transformers and other electrical equipment. The entire apparatus was handled by a locomotive, from which steam was furnished to operate the dynamo.

The *modus operandi* consisted of charging the brush with electricity and moving it slowly along in contact with the vegetation, the theory being that the current would leave the brush, enter the plants, and, by breaking down their cellular tissue, destroy their vitality. The principal difficulty encountered, devoid of technicalities, was in supplying the necessary quantity and strength of electrical energy to perform its functions. In the experiments that were made, the immersion of the brush in the thick Bermuda grass that covered the track where the test was held exhausted the electrical force within the distance of a few feet, moving at a speed of three or four miles an hour, without any appreciable effect on the grass at the moment of application; but on the following day the grass to which the brush had first been applied, when the current was at its full intensity, was found to be dried up and quite dead. Where the brush was suspended so as to barely touch the edges of weed growth, or where the current could be concentrated upon isolated pieces of vegetation, the plants receiving the charge were entirely destroyed and burned. Also milk weed and other vegetable matter in which there was a large percentage of moisture, would, when brought in contact with the brush, absorb the current and be killed, while the drier grass which came in contact with the brush at the same time would not be injured.

I received your letter while out on the road, and have no data at hand showing the amount and intensity of the electric current used, or the amount of horse power and other scientific information which would be of interest only to technical engineers or others desiring to thoroughly investigate the subject. I was personally present, however, when the experiments were made, and was compelled to draw my own conclusions as to the value of the machine; which were, that it would require an expenditure of $20,000 or $25,000 to construct a perfect and efficient apparatus on this principle, and that it would require at least a 500-H. P. dynamo and electric apparatus, with the necessary steam power for same, to secure economical and satisfactory results. It also seems to me it would be necessary to subdivide the brush into small sections insulated from each other, so that the electric energy would not be concentrated on a single weed or clump of vegetation which might be a superior conductor. The brush would also have to be of such flexibility and so easy of control that it would readily conform to the cross-sections of the roadbed and be readily manipulated.

Even a large machine of the character indicated, with all the necessary improvements, would be able to only partially destroy vegetation for a width of approximately 10 to 12 ft.; and then there would probably remain more or less vegetation which would not be affected and would have to be removed by ordinary track methods. I have no doubt, however, that if the idea was taken up by an educated mechanical engineer, assisted by an electrician, and the requisite funds supplied, a machine could eventually be devised that would be practical. More extended experiments would, of course, have to be made in order to determine the amount of amperes, voltage, etc., required to give the most economical and efficient results; and it will be necessary for the machine to completely kill vegetation inside of the rails and for a space of three to four feet on each side, and be able to do so continuously at a rate of five or six miles per hour, in order to do satisfactory work.

The advantage of this method of destroying vegetation is in the destruction being absolute. The partial destruction accomplished during the above-mentioned experiments would not be satisfactory. After the tests we made, I pulled up several large weeds which were $\frac{1}{16}$ to $\frac{1}{8}$-in. in diameter, and were so hot at the surface of the ground that they could scarcely be held, and the heat was felt at the extremities of the roots, while other pieces which did not appear to be affected when the brush was applied were dead the next morning.

These experiments were made during 1894, and were discontinued on account of the uncertainty of being able to arrive at any practical results at a moderate expense.

I have answered your letter at length because of the large number of inquiries I have received from various persons in relation to this apparatus, and I would refer to the inventor, Captain Sharp, for further information. Mr. Sharp may have made further experiments, of which I have not been advised, and I have no doubt he will be glad to answer all inquiries.

J. F. WALLACE, *Chief Engineer.*

Economical Use of Large Freight Cars.*

As stated in an article by Mr. S. H. Church, of the Pennsylvania Company, before this Association last year, there is still much to do in promoting efficiency in the methods of car distribution. The inequalities and inconsistencies of the present minimums in the official classifications, as relates to size and capacity of cars constitute an abuse which needs to be reformed. We are satisfied from conference and correspondence that it would be beneficial to any company to make rates per hundred pounds, regardless of the quantity, abolishing the car-load rating entirely, except upon freight that can be loaded to, say, 30,000 lbs. in small cars, in lieu of any minimum, or with a special tariff on commodities when loaded in cars of more than standard length and size. But a radical reform of that nature cannot be introduced without the co-operation of all roads as well as the various traffic associations. . . .

Shippers usually order, in fact, insist upon having cars of large dimensions, for all classes of freight, and we propose the limitation of existing car-load weights to cars of a standard length and size, the minimum weights to be increased for cars exceeding the standard, thus making a premium on large cars. Roads having cars of greater length than 34 ft. are best able to judge of the present inconsistencies and of the necessity for an organized effort to utilize small cars. At a meeting with the Western Classification Committee at Chicago, June 18, the following gentlemen were present: J. T. Ripley, Chairman; C. H. Knepp, Chicago & Northwestern; W. B. Hamblin, Chicago, Burlington & Quincy; C. Haile, Missouri, Kansas & Texas, representing the Western Classification Committee; C. H. Bieber, General Car Agent of the Michigan Central, Chairman; F. M. Luce, Chicago & North-Western; W. E. Beecham, Chicago, Milwaukee & St. Paul, representing the International Association of Car Accountants. Chairman Ripley presented statistics conclusively showing the necessity for urging immediate reductions in the minimums of Western classification, and after much discussion the following plan of adjustment was proposed and decided upon as the best mode of procedure, namely, that such a revision or reduction be made in the minimum weights for light and bulky articles as will allow of the prescribed minimum being loaded in cars of ordinary or standard size, with a special rate or premium per foot to be charged for each foot over and above the standard size, compelling the shipper to pay correspondingly more for the use of larger cars.

The result of this meeting, we are pleased to report, was the issuance of a notice by Chairman Ripley authorizing changes in the Western classification to take effect Sept. 15, 1895, reducing the minimum weights on about 400 commodities, so that such articles can now be shipped in 34-ft. box cars, when formerly nothing but furniture cars would satisfy shippers. We give below a partial list of the changes agreed upon as shown by the circular referred to:

Articles.	Former minimum weight.	Minimum weight agreed upon.
Agricultural implements (except fanning mills and food and ensilage cutlery)	24,000 lbs.	20,000 lbs.
Fanning mills	24,000 "	12,000 "
Feed and ensilage cutters	24,000 "	15,000 "
Tanners' bark	24,000 "	20,000 "
Baggage vans or barrows	24,000 "	20,000 "
Demijohns	24,000 "	16,000 "
Paper, straw or wood bottle wrappers	24,000 "	20,000 "
Paper boxes, K. D.	24,000 "	20,000 "
Glassware	20,000 "	16,000 "
Shavings	24,000 "	20,000 "
Woods, turned	24,000 "	20,000 "
Sewing machines	20,000 "	10,000 "
Furnace pipe and elbows	24,000 "	10,000 "
Stoves	24,000 "	20,000 "
Buggies, sleighs and other light vehicles and parts thereof	12,000 "	12,000 "
Coffin boxes, plain packing, nested	24,000 "	10,000 "
Carboys	24,000 "	16,000 "
Galvanized iron eave troughs	24,000 "	20,000 "
Cedar fence posts	24,000 "	20,000 "
Fire kindlers	24,000 "	20,000 "
Church furniture	16,000 "	10,000 "
School desks	24,000 "	20,000 "
Spring beds	24,000 "	20,000 "
Tables and table slides	24,000 "	20,000 "
Furniture, new (N. O. S.)	12,000 "	10,000 "

The original plan has been somewhat modified. It was considered more desirable by the Western Classification Committee to reduce the prescribed minimum weights in every instance, except one, namely, that on passenger vehicles, which provides for a premium of five per cent. per foot in the minimum weight when loaded in cars over 45 ft. in length, outside measurements, and for a deduction of five per cent. per foot for each foot less than 45 ft., the charges, however, on any carload shipment not to be less than for 4,000 lbs. at first-class rate. This rule, to the best of our knowledge and belief, is being enforced. Mr. Ripley informs us that the premium charge plan met with much more opposition than he anticipated; hence, its adaptation to other articles, and its continuation on vehicles is somewhat doubtful. As to the reduction in minimum weights, as agreed upon, we are gratified to note that it is meeting with general satisfaction, so much so, that the advisability of considering further changes is talked of, in order to promote still greater efficiency in car distribution.

The foregoing refers to the action west of Chicago. The status of the matter in the official classification territory, east of Chicago and north of the Ohio River, is not so well advanced, but definite action was taken by the Official Classification Committee Oct. 28. The vote of the Joint Committee upon the report of the Official Classification Committee was not, however, unanimous, and further consideration will be necessary. The committee (Mr. Gill, chairman) says: "The proposed graduated scale of minimum weights for car-load freight appears to be based solely on the inside length of cars. In view of the various dimensions of packages of different light and bulky freight, and the varying heights and widths of box-cars, should a graduated scale of minimum weights be adopted, it would be more equitable to base such scale upon the cubic capacity, rather than on the length of cars only. But a small percentage of the cars in use have their inside lengths marked upon them, and the determination of the minimum weights to be charged on cars not so marked would be a matter of doubt. Many such cars would be loaded at points where there are no agents. For these reasons, the plan proposed seems impracticable under present conditions. Preliminary to the adoption of a graduated scale of minimum weights, it appears desirable that cars should have plainly stenciled upon them all measurements necessary to determine the minimum weight to be charged in each case." This action postpones the matter until the next meeting of the Official Classification Committee in October, 1896. This subject has received extended consideration by a Committee of the New York Railroad Club, of which Mr. Wheatley was Chairman. The proceedings of the club (Feb. 20, 1896), contain an able, comprehensive and exhaustive report on the subject.

Our Association can have no further part in solving this vexed question, other than to use our personal influence so far as possible with the various departments of our respective companies, upon the following line:

First—With the Traffic Department: To urge a readjustment of freight classification so as to minimize the demand for large cars and the graduation of the minimums above an agreed standard—say 34 ft. on an agreed cubical standard, compelling the payment of a premium where large cars are wanted. The suggestion should be urged that the car-load rating apply on the heavier and coarser freight only. This would be a radical change, but it is coming more and more into favor as a solution of the problem, and it is expected an article will shortly appear in the *Railroad Gazette*, by Mr. Emerson W. Judd, managing editor of the *Florida Citizen*, advocating this idea.

Second.—With the Mechanical Department; to establish a standard for cars to be used in general interchange, as to tonnage, carrying capacity and cubical measurement; to strengthen large cars, built primarily for bulky articles, so as to use them on the return journey for heavy freight. Third.—With the Managers; by laying before them the importance of the question in saving of car mileage, and suggesting their early action, pending the forthcoming report from the Master Car Builders as to agreement of standard-sized cars, and parts thereof with the object in view of making them more available for general interchange.

* Report of the Committee on Official Classification and Large Cars, C. H. Bieber (Mich. Central), Chairman, read at the Convention of the International Association of Car Accountants at Cleveland, June 9, 1896. (Condensed.)

Effect of Fire on Machinery.*

Not long ago I had occasion to examine a considerable amount of machinery which had passed through fire, some of which was quite heavy.

The building containing the machinery was of brick,

* A topical talk by Prof. W. F. M. Goss at the St. Louis meeting Am. Soc. M. E.

with a heavy mill floor and a ceiled wooden roof with monitor. The heat developed was probably of average intensity for such a building, the fire burning until all the woodwork had been consumed. But little water was used, and the machinery did not suffer from this cause to have arisen from three causes, namely; the falling of the machinery, the falling of the roof timbers and walls upon the machinery, and the action of the heat itself.

Machines which were on good foundation did not suffer from the first named cause; but when there was no foundation, even heavy tools were either broken by the fall or distorted by the combined action of the heat and of strains resulting from imperfect support after the fall. The results justify the conclusion that in case of fire an indestructible foundation is an excellent life-preserver for a machine.

Falling debris carried away all lighter attachments such as lubricators, gages, small piping, light shafts, rods, levers, hand-wheels, projecting brackets—everything, in fact, which offered an abutting surface to the falling masses and which was not strong enough to withstand their impact. There were a few cases where heavier parts also suffered from this cause. Of two 6-in. shafts extending 7 ft. between bearings, one carrying an 8-ft. fly-wheel was perfectly straight, the other, having no wheel, was sprung, evidently as the result of a blow.

To heat alone is, of course, to be attributed the destruction of woodwork about the machines, and the loss of babbitt from brasses and boxes. From this cause, also, bolts which served to connect different parts of heavy frames were often found loose. Steam-joints of every kind required refitting. Brass bushings which originally had been forced into turned holes to form bearings for shafts or pins were all loose in the castings and tight on the shaft. Castings having very large flat surfaces, either plain or ribbed, were in several cases found to contain fire cracks, but with a few exceptions heavy castings of good design were not injured by heat alone.

What experience have other members had as to the injury done to machinery when the building has burned in which it stood?

80,000-lb. Ore Car for the Erie Railroad.

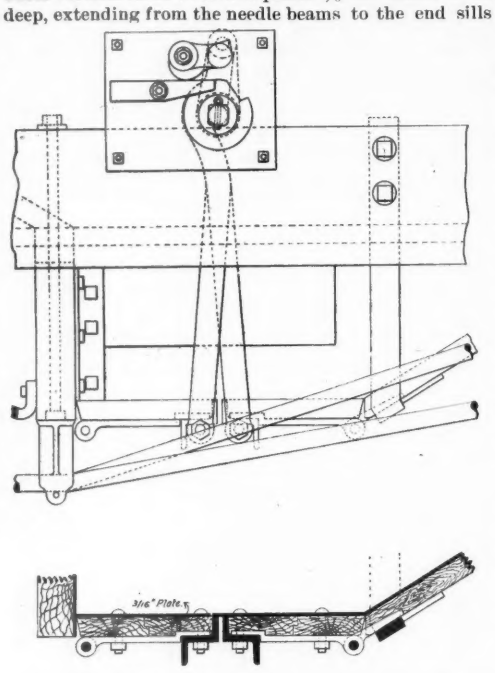
The Erie Railroad Company will soon build for trial an 80,000-lb. twin hopper gondola ore car. We have received from Mr. A. E. Mitchell, Superintendent of Motive Power, blue-prints and a copy of the specifications under which the car will be built, and the general design of the car and some details are shown in the engravings reproduced from those blue-prints. The description which follows is abbreviated from the specifications.

The general dimensions are:

Length over end sills	36 ft. 1¼ in.
Length inside	34 ft.
Width over side sills	8 ft. 5⅛ in.
Width inside	8 ft.
Size of hopper openings	2 ft. 6 in × 5 ft. 1 in.

The end sills (white oak) are 8⅞ in. × 10¾ in. The draw timbers (white oak) are 5 in. × 10 in. and 4 ft. 10⅝ in. long. The side sills (Norway pine) are 4 in. × 14 in., and the draft sills 5 in. × 10 in.

The longitudinal sills are to be framed into end sills by double tenons, 1½ in × 1½ in.: each center still to be sides by angle plates and to be supported by posts framed into cross pieces. A 1-in. tie-rod to run from side to side under the flooring near the intermediate cross piece. The center sills are to be plated on their outer vertical faces with iron plates ⅝ in. thick, 8 in. deep, extending from the needle beams to the end sills



Detail of McMahon Hopper Door Rigging—Erie 80,000-lb. Car.

and well bolted to center sills, plates to pass above body bolsters.

The body bolsters are to be made of three pieces of white oak, 7 ft. 5¾ in. long, and four pieces of iron 8 in. in depth, 1 in. in thickness, and 7 ft. 5¾ in. long: iron plates and wooden strips to be placed alternately with bottom edges of iron plates flush with undersides of wooden strips. Bolsters to be 14 in. wide; parts bolted with fifteen ¾-in. bolts with nut ends riveted over; the wooden portions to be gained ½ in. for sills.

The doors of hoppers and the operating shafts are to be fitted with the McMahon patent hopper attachments. [See *Railroad Gazette*, Feb. 28.] The shafts for the hopper doors are to be wrought iron, 2½ in. diameter at central portion and provided at the ends with square and round sections for the attachment of the rockers and for the end bearings respectively; pawl to have a

The body and truck center plates are from the Fox Pressed Steel Company, and designed to carry a lading of 85,000 lbs. in addition to the weight of the car body, which may be assumed to be 20,000 lbs. The side bearings are of malleable iron. The truck side bearings are to have heavy pieces of canvas placed under them before being bolted on, to give a more even bearing surface.

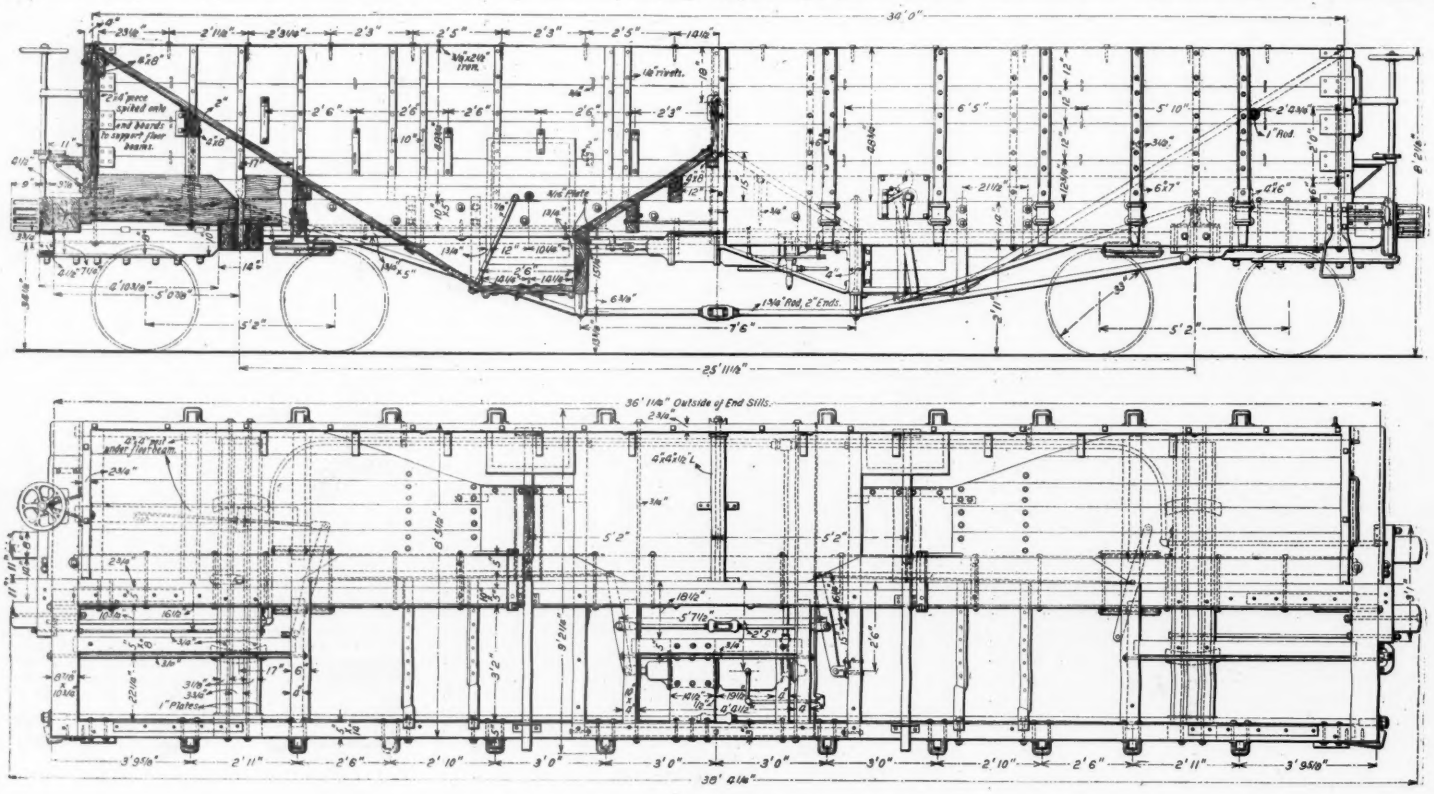
The trucks are to be of the latest Fox pressed steel pattern for freight cars, designed for use under a car of 80,000 lbs. capacity. The wheel pieces and transoms to be at least ½-in. thick, the wheel base to be 5 ft. 2 in., the width of pedestal opening and distance between centers of journals to be the same as with the Fox pressed steel truck frames for cars of 60,000 lbs. capacity; which have already been supplied to the Erie Railroad Company. Truck springs to be made by the A. French Spring Company, to stand 7 in. high, free, and to have an easy motion and a deflection of ⅞ in. under load of 13,150 lbs.

The draw timbers are to be secured to car with seven ⅞-in. bolts through each timber; six of these bolts have cup floor washers and two pass through malleable iron lock plates. Timbers to be mounted with Graham malleable iron drawbar stops; a block of hard wood, ¾ in. thick, to be nailed to outside of draw timbers, locking all the nuts and bolts on side bolts through drawbar stops.

The cars are to be equipped with either the American, Gould or Standard M. C. B. drawbar, at the option of the Erie Railroad Company. Drawbar to have square lips on end of shank in order to take the ends of strap; Graham cast steel followers or thimbles. The railroad company reserves the right to have one or all of the three kinds of couplers above mentioned furnished for the cars covered by this specification.

The stake pockets are to be of malleable iron, 10 each side of car, secured to side sills. Stakes riveted to sides by ½-in. button head rivets, wrought iron washer plates under tail of rivets and wrought iron washers under heads. Strap bolts riveted to sides and ends by ½-in. button head rivets; wrought iron washers under heads of rivets. Sides and ends protected from wear by ⅝-in. × 2½-in. wrought iron plates, extending full length of sides and ends and fastened with ⅝-in. lags crews, 4½ in. long in addition to the ¾-in. rods. End planks of sufficient length to extend from outside to outside of side planks. Center stake on each side to be made of 5-in. channel iron or steel, shape C 8, 12 lbs. per ft., page 9, Carnegie Steel Co.'s 1893 catalogue; or 5-in. channel 34 lbs. per yard, shown on Plate XIII. of the New Jersey Steel and Iron Co.'s 1891 catalogue.

In addition to the two 1-in. side tie-rods, which extend transversely across car, under the inclined floor at the sides of the intermediate supports, there is to be a tie-rod 1½ in. in diameter extending transversely across car at its center and passing through channel iron stakes; the center tie to be protected by 4-in. × 4-in. angle iron.



Twin Hopper Ore Car, Erie Railroad—80,000 Lbs. Capacity.

Mr. A. E. MITCHELL, Supt. Motive Power. *Mr. G. H. GOODELL, Mechanical Engineer.*

secured to end sills by one ⅞-in. strap bolt. In addition to the double tenons, the ends of side sills to extend beneath end sills, secured by one ¾ in. bolt in each end. . . . Ten ¾-in. frame tie-rods to be used, four extending from cross pieces to and through end sills, four extending across car through side sills and two through center cross pieces, with cast-iron washers under nuts and heads. Cross pieces to support floor at ends of car to be bolted to end planks, and supported by posts, 2 in. × 5 in., running from underside of cross pieces to tops of sills. Intermediate cross pieces to be fastened to gravity lock, as shown. Shafts to be further provided with short lever or crank to facilitate dumping. One side of car and tops of draft sills to be protected from wear caused by winding shafts by ⅜-in. wrought iron plates. Tops of side sills to be protected from wear caused by shafts by angle irons, which are to also serve as bearings for the shaft.

The sides and doors of hoppers and needle beams adjacent to hopper, center sills and filling block at portion immediately over hopper, and center inclined flooring are to be plated with iron or steel $\frac{5}{16}$ in. thick.

resting at its ends in a socket casting attached to the inside face of sides of car. The central cross side tie-rod to be further supported by an oak plank 2¾ in. thick, upon the top of which the tie-rod is to rest.

The body truss rods are four in number, of 1¾-in. round iron, passing through end sills, to have both ends upset to 2 in. in diameter; rods connected in center by pressed wrought iron open turn-buckles, manufactured by the Cleveland City Forge & Iron Co. The outside body truss rods to be attached to truss rod strap-irons on under side of side sills by pins 1½ in. in diameter, and

connected in the center as above described. Rods to pass under malleable bearings under tie timber and over body bolsters on cast iron saddles, then through end sills and the malleable iron corner plates.

The king bolt is of wrought iron of best quality, 1¾ in. diameter, and 30 in. long under the head, with solid head resting on top of filling block. Provision to be made in filling block for removing pin. King bolt to be secured from working upward by a split key passing through its lower end below truck center plate.

The journal boxes are cast iron, with pressed steel lids, hung from top of boxes. Bearing keys of cast steel. Bearings to be Hewitt, Brady Metal Co., or United States Bronze Works, lead lined, and cast from mixture of copper 85, tin 14 and zinc 1. Lead lining should not weigh more than 1¼ lbs.

The axles are of open-hearth steel: the wheels 33 in. in diameter, 5½ in. over tread and flange and to weigh 650 lbs.

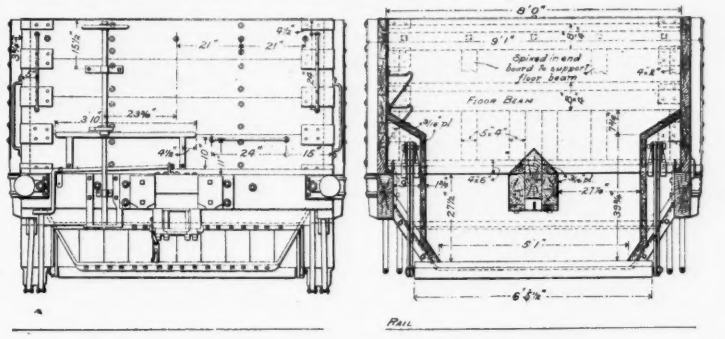
All malleable castings are to be furnished by either the Dayton Malleable Iron Co., Dayton, O., the C. E. Rood Malleable Iron Works, Lancaster, N. Y., or the National Malleable Castings Co., Toledo or Cleveland works.

The cars are to be equipped with the latest improved Westinghouse automatic brakes for freight cars, having the improved triple valve piping and fitting to be as recommended by the Westinghouse Air Brake Co. Brakes to be attached to both trucks on each car between the wheels. Christie brake head of malleable, and cast iron shoes, secured to Kewanee steel brake beam. Cars to be equipped with the Peerless Rubber Co.'s air-brake hose.

The journal boxes are to be equipped with suitable dust guards and packed with elastic wool waste as furnished by Elastic Packing Manufacturing Co., of Newark, N. J.

Cars to be painted with three coats of Patterson-Sargent Co.'s or Sherwin-Williams Co.'s ready-mixed paint for freight cars, "Prince's Metallic Brown, Perfect Method," Erie standard. The number of the car to be stamped in each end of each truck bolster with figures 1 in. high. Dimensions of journals also to be stencilled on each end of each truck bolster with figures and letters ⅜ in. high. Air-brake cylinder to be stencilled as shown by drawings. All joints in car framing to be coated with Fernoline oil before putting together. Name of coupler and brake beam to be stencilled on car.

Heating surface combustion chamber	53.8 sq. ft.
Heating surface, tubes	1,614.9 sq. ft.
Heating surface, total	1,335 1 sq. ft
Grate area	76 sq. ft.
Drivers, number	4
" diameter	84¼ in.
" material of centers	O. h. cast-steel
Truck wheels, diameter (wrought iron centers)	36 in.
Trailing wheels, diameter	54¼ in.
Journals, driving axle, size	8½ in. diameter and 12 in. long
" truck " "	5½ in. diameter and 12 in. long.
" trailing wheels	7 in. × 12 in.
Cylinders, diameter	13 and 22 in.
Piston, stroke	26 in.
Valves, kind of	Piston
Boiler, type of	Straight, with one dome placed back of cab over firebox
" material in barrel	Homogeneous cast steel
" thickness of material in barrel	⅝ in.
" diameter of barrel	58¾ in.
Seams, kind of horizontal	Butt jointed and double riveted
Tubes, number	278
" material	Iron, No. 13 w. g.
" outside diameter	1¾ in.
" length over sheets	13 ft.



80-000-Lb. Twin Hopper Ore Car—Erie Railroad.

Firebox, length	113¾ in.
" width	96 in.
" material	Homogeneous cast steel
" thickness of sheets	Flue, ½ in.; side, back and crown, ⅜ in.
Grate, kind of	Water tubes and cast bars
Stack, straight or taper	Straight pattern

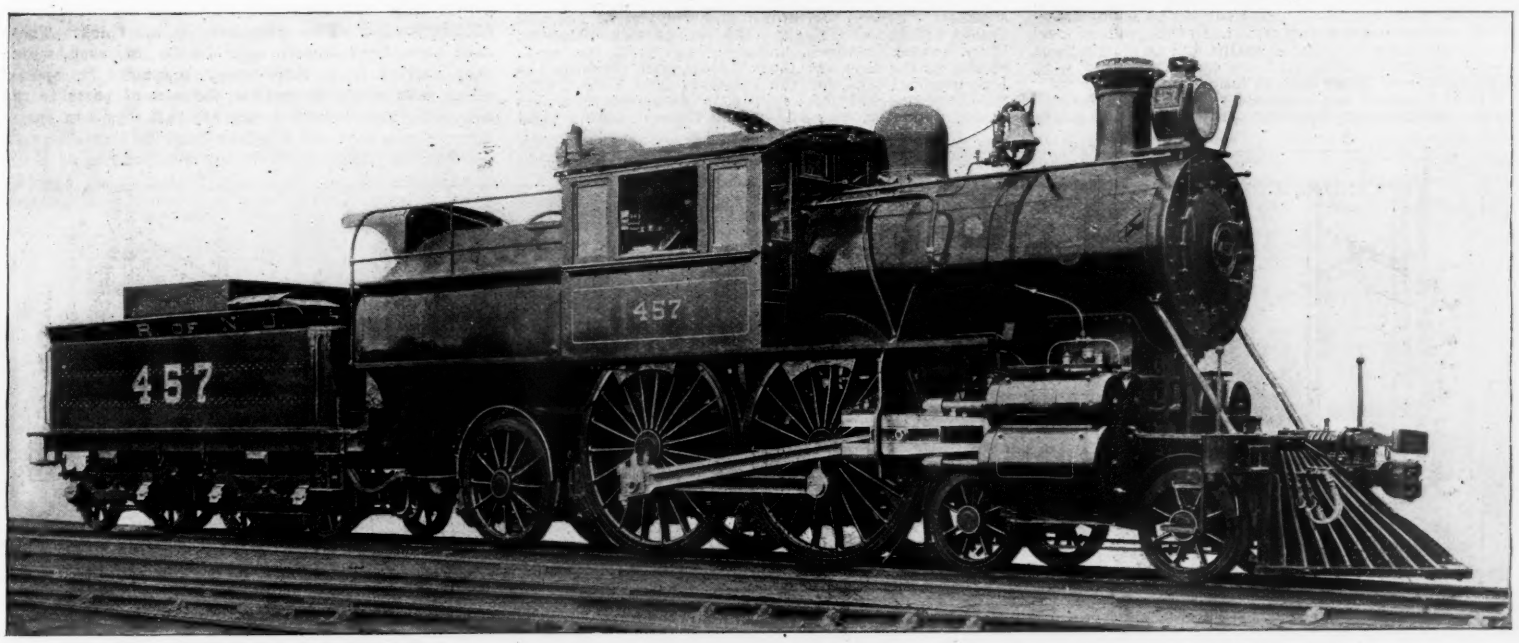
We take from the specifications some further particulars not tabulated above. The smokebox is extended 15 in.; the pistons are of cast iron and the piston rods are iron; the guides and crossheads are steel; the tires are steel and the driving tires 5¾ in. wide. The driving boxes are steeled cast iron, and the side rods are of I section with solid ends. The locomotive is supplied with two Metropolitan injectors with the Westinghouse-American brake on drivers, trailing and tender wheels. The tank is of 3,500 gals. capacity, carried on a channel-iron tender frame, and the tender wheels have wrought iron centers and steel tires, 36 in. in diameter, the journals being 5 in. × 8 in.

A New Baldwin Locomotive for the Central of New Jersey.

The Baldwin Locomotive Works have recently completed a locomotive of the "Atlantic" type for the Central Railroad of New Jersey, which is shown in the engraving herewith from a photograph. The engine has four drivers coupled, a four-wheel truck forward and a pair of trailing wheels behind the drivers. The principal dimensions are as in the table below:

GENERAL DIMENSIONS BALDWIN LOCOMOTIVE FOR CENTRAL RAILROAD OF NEW JERSEY.

Gage	4 ft. 8½ in.
Simple or compound	Compound (Vauclain)
Kind of fuel to be used	Buckwheat anthracite
Weight on drivers	80,000 lbs.
Weight, total	141,000 lbs.
Wheel base, total, of engine	26 ft. 5 in.
Wheel base, driving	7 ft. 3 in.
Heating surface, firebox	136.4 sq. ft.



Baldwin Locomotive, "Atlantic" Type, for the Central Railroad of New Jersey.

Hollow Steel Forgings.*

By this name I do not refer to steel forgings that have been forged solid under a hammer or press and subsequently bored, but to forgings which have been "forged hollow."

In order that I may not be misunderstood, I will briefly describe the process of making the type of forging referred to. Supposing that we have designed a hollow shaft or roll or cylinder of outside diameter D inside diameter, D^1, length L, and solid volume $\frac{1}{4}\pi D^1 L$, an ingot must be cast to forge it from having a diameter $2D$, volume $\frac{3}{4}\pi D^2 L$ and length L^1. From the upper part of this ingot 25 per cent. is cut off and rejected, and a hole of diameter D^1 is bored through the longitudinal axis of the remainder. This is then reheated, a mandrel of diameter D^1 is run through the axial hole, and then the mass is forged down under a hydraulic press from $2D$ and length L^1 to D and L, the inside diameter D^1 remaining the same.

The reasons for adopting this method of producing hollow forgings are many and various and the result of long experimenting. In the first place, as the walls of hollow forgings are comparatively thin, the metal must be thoroughly worked, homogeneous throughout, and absolutely without flaw or defect of any kind. For this purpose, therefore, only open-hearth steel is used, and that of a grade that will best insure satisfactory working. Its carbon may vary according to the purposes to which the forging will finally be applied, but its phosphorus and sulphur should not exceed .04 per cent. In order that the metal should be sufficiently worked to give it strength and toughness, the best practice requires that the ingot should be at least twice the diameter of the finished forging. A 24-inch or 36-inch shaft or roll, for instance, would be worked down from 48-inch and 72-inch ingots respectively. Ingots of these sizes are liable to "surface defects," "blow holes," "piping" and "segregation." To aid in avoiding the two latter, ingots are made from 25 to 30 per cent. longer than necessary, as these defects occur in the upper and central portion, that being the locality of last cooling. This part is subsequently cut off and returned to scrap. Of all the various methods that have been devised to secure solid and homogeneous ingots, without doubt the most efficient and most to be depended upon is the "Whitworth process of fluid compression." This consists in subjecting the metal in the mould, while fluid, to hydraulic pressure up to 7,000 tons if necessary. This pressure is continued until the metal is solid throughout, great care being taken to cool the ingot slowly and equally on all sides. After it has cooled and the upper part has been cut off, a hole nearly the size required in the finished forging is bored through it. This boring out of the center takes away that portion of the ingot where impurities may have concentrated and where there may have been a tendency toward "piping." We now have a piece of steel which is as nearly perfect as can be produced, and it is ready for the forging process.

In the process of reheating, the heat must penetrate it slowly and uniformly, after which a mandrel of the proper size to fit loosely in the hole is inserted and the piece is taken to the press, where it is drawn out over the mandrel by an even pressure to the required dimensions.

Forgings must be hollow to be tempered successfully, otherwise strains may be introduced which result in weakening instead of strengthening the piece. Authorities on machine design (Unwin, Seaton and others) say that solid shafts up to 10 in. in diameter may be subjected to a fibre strain of 9,000 lbs. in wrought iron and 12,000 lbs. in steel. Above 10 in. in diameter, however, iron shafts must not be subjected to more than 8 000 lbs., and steel shafts to more than 10,000 lbs. The reason assigned is, that forges do not possess hammers heavy enough to affect the center of shafts larger than 10 in. in diameter; or if by top steam or long drop they are able to be felt through the whole forging, the effect is produced by velocity of impact rather than by weight of falling mass. This results in damaging the surface, with a tendency to draw it out, leaving the central portion behind, thus producing a tearing strain on the core, producing at times actual cavities. Heavy shafts forged under light hammers show the effect of this treatment in having concave ends, while shafts forged under sufficiently heavy hammers or under the hydraulic press show bulging ends, the metal in the center, where it is hottest and softest, being pressed out. Another reason why authorities place a higher safety factor on large shafts, especially of steel, is on account of the liability of steel ingots to have "piping" and other defects in their center.

With hollow forgings manufactured under the processes here described, these objections are met by taking out the possibly detective center altogether. By substituting for it, during the process of forging, a mandrel, the latter acts as an internal anvil, and thus even in the largest hollow shafts the thickness of metal worked upon would be within the limits above mentioned. The use of hydraulic presses having a capacity of from 2,000 to 14,000 tons, selected according to the size of the forging under treatment, can leave no doubt in the most incredulous minds that the metal has been thoroughly worked. Take, for instance, the Ferris wheel shaft, the largest ever made, 32 in. in diameter, with a 16-in. hole through it. The walls of this shaft are only 8 in. thick between the mandril and the press, and the metal, therefore, is in better condition, as far as its physical properties are concerned, than in an 8-in. solid shaft, the center or poorer portion of which has not been removed. Or take, for example, a shaft 32 in. outside diameter, 16 in. inside diameter, and we find that when compared with a solid shaft of the same outside diameter it has lost 25 per cent. in weight and gained 12 per cent. in strength. Under the above circumstances hollow-forged shafts are shown to be as strong or stronger than solid shafts of the same diameter. With the substitution in the trade of steel for wrought iron in engine and miscellaneous forgings the tendency has naturally been to use a mild or soft steel approaching iron as regards physical qualities and in the ease with which it can be

* Extracts from a paper by Mr. H. F. J. Porter, presented at the St. Louis meeting of the Am. Soc. M. E.

machined. Wrought iron has a low elastic limit, averaging about 20,000 lbs. per square inch in large sections, where proper care is taken in its production.

Although mild steel, when of good quality, is superior to wrought iron in strength, toughness, homogeneity, and freedom from danger of imperfect welds and porous spots enclosing slag and scale, still it does not possess the very desirable quality of high elastic strength combined with ductility or toughness in as great a degree as can be obtained without danger in a harder steel, when proper precautions are taken in its manufacture. In other words, in the use of ordinary mild steel, only a partial advantage is taken of the most desirable qualities of steel which are easily within reach. In some instances where the amount of machine work in finishing is very great and there is ample margin of safety in the design, as, for instance, is often the case with connecting rods, the use of mild steel may be advisable. Such steel contains about .20 to .25 of one per cent. carbon, and can be guaranteed to show, in specimens four diameters in length cut from a full-sized prolongation of forgings or from representative pieces, a tensile strength of not less than 57,000 lbs. per square inch, and an elastic limit of not less than 27,000 lbs. per square inch, with an average elongation of 25 per cent.

For the general run of engine forgings, however, a harder steel should be used in which a tensile strength of about 75,000 lbs. and an elastic limit of 35,000 lbs. per square inch can be obtained, together with an average elongation of 20 per cent. in four diameters.

When proper precautions are employed, forgings can be made with perfect safety of a still higher grade of steel, and this is especially recommended for crank and cross-head pins and for all parts subject to severe alternating strains and wearing action. In this grade of steel a tensile strength of about 85,000 lbs. and an elastic limit of about 40,000 lbs. per square inch can be obtained, with an elongation of 15 per cent. in four diameters.

If steel forgings are tempered they will possess still higher qualities than those above mentioned, and can be furnished with a tensile strength of 85,000 to 90,000 lbs. and an elastic limit of 45,000 to 55,000 lbs. per square inch, and an elongation of 15 to 20 per cent. in four diameters.

By introducing about three per cent. of nickel into the composition of steel, a finely granular or amorphous condition is obtained in forgings, and the very highest quality of steel is attained.

By the combination of hollow forgings and tempering this nickel steel a material is obtained excelling all others known in elastic strength and toughness. As an example of this can be mentioned shafts made for the United States war ship Brooklyn, 17 in. outside diameter, 11 in. inside diameter, and 39 ft. long, weighing 19,112 lbs. These showed in specimens cut from full-sized prolongations a tensile strength of 94,245 lbs., an elastic limit of 60,775 lbs. per square inch, an elongation of 25.55 per cent., and a contraction of area of 60.58 per cent.

Professor Merriman is quoted in a paper read before the Society of Naval Architects and Marine Engineers* in 1893, by R. W. Davenport, as estimating the strength of these shafts compared to solid shafts as follows, when strained to one-half their elastic limit:

1. Propeller shaft United States steamship Brooklyn, nickel steel, hollow forged, outside diamater 17 in., inside diameter 11 in

a. Horse power transmitted at 50 revolutions per minute, 15,780.

b. Load in pounds at middle of a span of 12 ft. on two supports, 276,200.

2. Simple steel shaft, solid, 13 in. diameter (same weight as above).

a. Horse power transmitted under similar conditions, 5,130.

b. Load in pounds under similar conditions, 89,000. Comparative strength as 3 to 1.

3. A solid shaft of simple steel of the same strength as the hollow-forged nickel steel shaft would be 18 ft. 9 in. diameter, and weigh 53 per cent. more.

Fluid compressed steel of .40 to .45 of one per cent. carbon, and more especially nickel steel, oil-tempered, is markedly adapted for piston rods of rock drills, mining machines and hydraulic presses, and for drop-hammer rods, stamp stems, cam shafts and similar pieces that are subjected to stress alternating between tension and compression, or of either kind, frequently repeated.

Prominent among hollow forgings are the Ferris wheel shaft, 32 in. outside diameter, 16 in. inside diameter, 45 ft. long, weighing 89,320 lbs.; and shafts for the steamers Puritan, Plymouth and Pilgrim, of the Old Colony Steamboat Company, 20½ in. outside diameter, 12 in. inside diameter, and weighing 65,832 lbs. each. Shafts for the navy are made hollow, and those for the International Line, for the steamers New York, Paris, St. Louis and St. Paul, are 21 in. in diameter, crank pins 22 in. diameter, with a 10-in. hole through both. Field rings of nickel steel were hollow-forged for the 5,000 H. P. Westinghouse dynamos at Niagara Falls, 11 ft. 7⅝ in. diameter, 4 1/16 in. thick, and 4 ft. 2¾ in. wide, weighing 28,840 lbs.

Thus it will be seen that there is scarcely any limit, either in length or diameter, to the proportions of forgings which can now be made by processes which have been perfected. In this, as in every other direction, the demand seems to have been more than met by the enterprise of the manufacturer, and engineers have a wide field opened before them for the display of their prowess, and it would seem as if they are rapidly taking possession of it.

* An abstract of which will be found in the *Railroad Gazette*, Dec. 1, 1893 (page 865).

Carnegie 50-Ton Steel Cars.

We show herewith illustrations of two steel cars which the Carnegie Steel Company, Limited, of Pittsburgh, has made for the purpose of illustrating good steel car construction, and which will be exhibited at the conventions at Saratoga next week and the week after. There are two hopper cars like that shown in Fig. 1, and two platform cars like that shown in Fig. 2. The former have lately been completed, while the platform cars have been in service about a year. Fig. 3 is a general drawing of the underframe of the hopper car; Fig. 4 shows side and sectional elevations; Fig. 5 shows plans and Fig. 6 transverse views. The Carnegie Company has no intention of going into the business of making cars, but these four were built at the Keystone Bridge Works of the company.

The gondolas are of the double-hopper type and have Fox pressed steel trucks. They have the Westinghouse friction buffer, Janney couplers and Westinghouse air brakes. The axles are made of nickel steel, which is so tough that a car will run with safety even after the appearance of a well-developed crack in the journal. The hoppers have the Potter apparatus for opening and closing.

The weight of each car is 39,950 lbs., with a capacity of 100,000 lbs. The sides are 3/16 in. thick. These cars have been loaded with 125,000 lbs. each, which they carried in a satisfactory manner. No special effort was made to reduce the size of parts to the lowest limit, and the designers say that they can easily reduce the weight to about 33,000 lbs., while still retaining a capacity of 100,000 lbs., with a suitable factor of safety. This would make the dead weight only one-third that of the paying load, and the company states in its circular that on this basis steel cars can be constructed at a cost per ton of carrying capacity not exceeding that of wooden cars. The general dimensions of the hopper car are:

Length over end sills	30 ft.
Length between truck centers	19 ft. 10 in.
Wheel base of trucks	5 ft. 2 in.
Width over end sills	9 ft. 5½ in.
Width over door shafts	9 ft. 10⅝ in.
Length inside of end plates	28 ft.
Depth of sides over sills	5 ft. ¼ in.

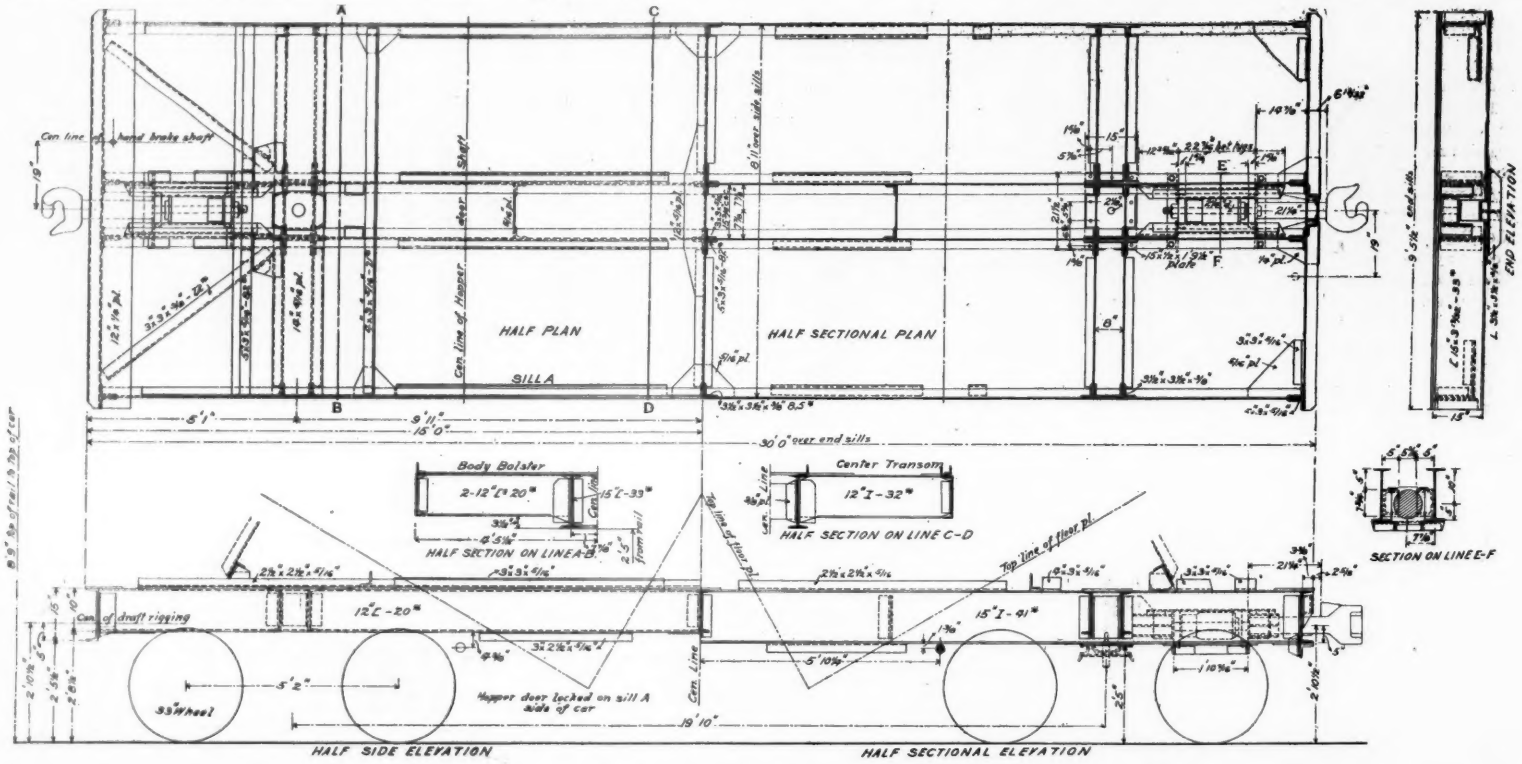


Fig. 3.—Steel Hopper Car of 100,000 Lbs. Capacity, Built by the Carnegie Steel Company, Limited.

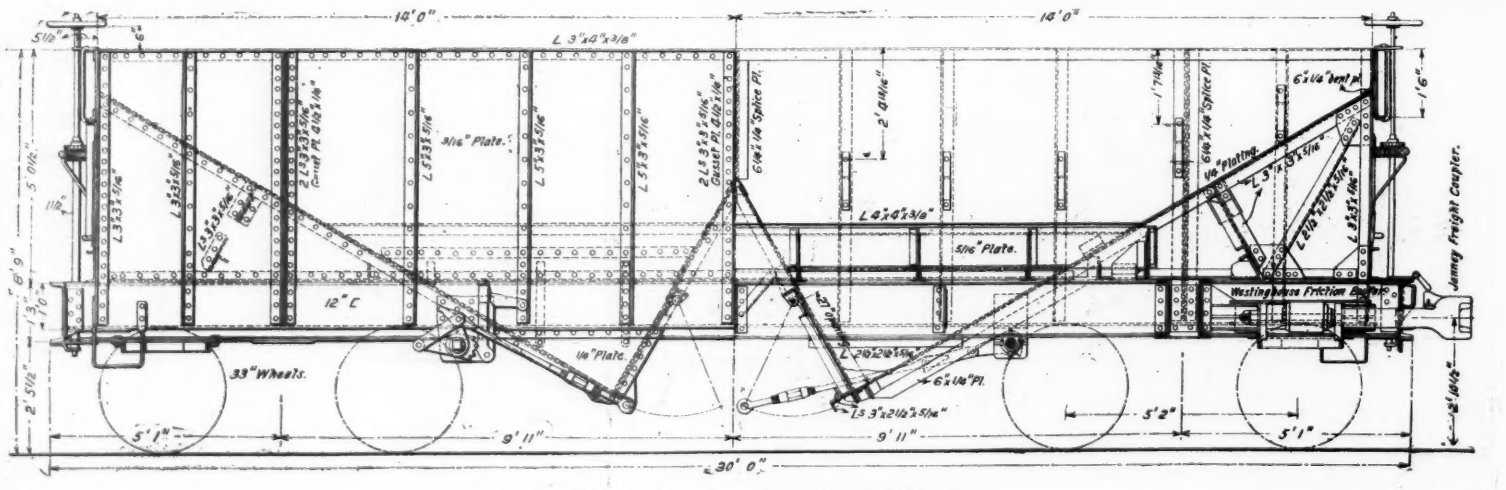


Fig. 4.—Half Side Elevation and Half-Sectional Elevation.

Height from top of rail to top of sides	8 ft. 9 in.
Extreme width over grab irons	10 ft. ⅜ in.
Journals	
Wheels, diameter	33 in.

The platform cars have plank floors 1½ in. thick, and their capacity is 80,000 lbs. each. No. 1002 weighs 26,220 lbs., and No. 1007 weighs 25,150 lbs. The general dimensions are:

Length over end sills	34 ft. 1 in.
Length between truck centers	24 ft.
Wheel base of trucks	5 ft. 2 in.
Width over decking	8 ft. 7⅛ in.
Width over stake pockets	9 ft. 5 in.
Height of deck from top of rails	3 ft. 11⅛ in.

The manufacturers present the usual arguments of lightness, durability and strength, and the reduced cost of maintenance; and the salvage value is definitely stated at $10 a ton, this being the calculated value of a worn-out car as scrap metal.

Fig. 2.—Carnegie Steel Flat Car, 80,000 Lbs. Capacity.

The Pennsylvania Railroad Voluntary Relief Department.

This institution—for it deserves that name, although it is only a department of a railroad—has now passed its tenth anniversary; it has disbursed nearly five million dollars, and the railroad company has spent more than a million upon it from its own treasury. While there is little to be said about it that has not already been given to the readers of the *Railroad Gazette*, the fact that railroad officers continue to ask for information about again stating the the department indicates that no apology is needed for salient features of such an importan establishment; and we give below a brief account prepared by an officer of the Pennsylvania road.

It is well known to many that the Pennsylvania gave early consideration to the subject of providing systematic aid for those who might meet with accident in the company's service. Schemes for this and kindred purposes had long been in operation in connection with many foreign companies, and in this country the Baltimore & Ohio preceded the Pennsylvania by some years in the operation of a relief fund upon much the same general plan as that adopted by the latter. These, however, were operated as organizations of the employees, chartered or otherwise, under the supervision of the corporations and with more or less financial aid from them. When, however, the Pennsylvania entered upon the work in 1886, it became the pioneer in establishing a distinct department of the service for operating the relief fund, with officers and agents on a parity with those of the operating and other departments, deriving and exercising authority in conformity with the rules governing the service generally. This feature gave strength and consistency not found in the plans elsewhere in use, having otherwise many features in common, and it has since been adopted upon the Pennsylvania's Western lines, and by the Chicago, Burlington & Quincy and the Philadelphia & Reading companies; and later by the Baltimore & Ohio upon the surrender of the charter under which the Employees' Relief Association of that company was at first operated.

At the outset it may be stated that this differs radically from those relief plans which consist chiefly or solely in provision for hospital accommodations for persons injured in the performance of duty. Whatever aid the Pennsylvania may give to hospitals to which its employees, in common with others, may find admission, is entirely independent of the Relief Department. In the part of the country traversed by the Pennsylvania's lines the necessity did not appear to exist of establishing a hospital system specially for its employees, and experience has shown the correctness of this view.

The primary idea of providing only for cases of accident on duty was found to be too limited and the plan was made to include relief in cases of sickness and benefits in case of death from any cause. The following are the chief principles upon which the plan is formulated:

1. Participation is voluntary and by employees only.
2. Membership is limited to applicants not over 45 years of age and who pass satisfactory physical examination, excepting that during the first six months all had the privilege of becoming members without respect to age or physical condition.
3. Contribution by each member, in advance for each month, of a definite amount going to form a fund from which certain definite benefits become payable.
4. No entrance fees, no assessments other than the regular contributions and no change in the latter excepting on application by a member for change in his "class."
5. Members arranged by "classes," according to wages, the first class contributing the smallest amount, the second twice as much and so on to five.
6. No distinction as to amount of contribution in any class on account of age.
7. Benefits of definite amounts for the several classes, proportioned to the relative amount of contributions and covering death from any cause and disablement by accident in the service or by sickness.
8. Management and care of funds by the company, with interest on monthly balances, payment by the company of all salaries and operating expenses and free use of office and transportation facilities.
9. Guarantee by the company of the payment of all benefits if contributions by members are not sufficient.
10. Any surplus that may occur, in either of the successive periods of three years each, to be used solely for the benefit of members of the fund and not to pay liabilities for any other period.
11. Collection of the contributions by deduction on the pay rolls, carrying that for each member at once to his account, without the delay or loss that might arise in the transmission of a multitude of small sums.
12. By reason of the last-mentioned provision a member is always "in benefit" if earning wages from which his contribution may be deducted.
13. Employment of medical men to devote their whole time to examining applicants for membership and to examining and reporting on members reported sick or injured and to duties connected therewith.
14. An advisory committee, to whom appeal may be made from decisions of the Superintendent of the Department, consisting of equal numbers of members chosen by the Board of Directors of the road and the members of the fund, with the general manager as member and chairman.
15. No changes in the Regulations but on adoption by the Advisory Committee and approval by the Board of Directors of the company.
16. Optional, in case of injury or death in the performance of duty, to accept benefits or make claim on the company.

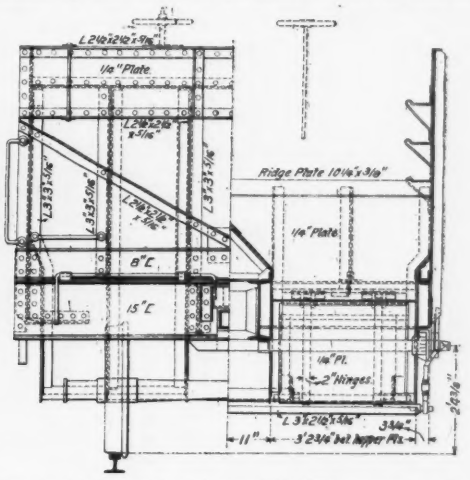


Fig. 6.—Half End Elevation and Half Transverse Section

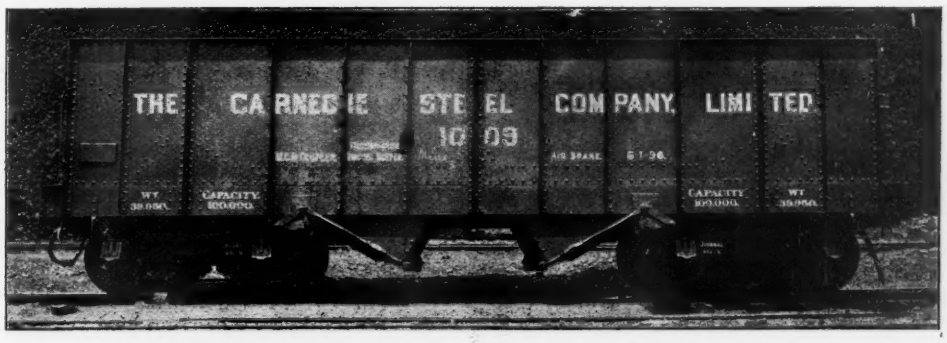


Fig. 1.—Carnegie Steel Hopper Car, 100,000 Lbs. Capacity.

The above are the general features. It is not here proposed to describe the details, as these can be learned from documents which the officers are always ready to send to those interested in ascertaining them. These, as well as some of the principles above enumerated, differ in some respects from those of other institutions of the same general character.

The operations of this Relief Fund extend to all the lines of the Pennsylvania Railroad Company's system east of Pittsburgh and Erie, the lines west of Pittsburgh being covered by a similar but separate organization. During the 10 years of operation, to Jan. 1, 1896 the benefits paid have amounted to $4,435,266.40. To this may be added the sum of $173,277.15 contributed by the company as supplementary relief for members remaining disabled by sickness after reaching the limit of the 52 weeks for which benefits are payable on this account from the Relief Fund. Including the last-mentioned sum, the amounts paid out by the company for operating expenses, deficiences, etc., have reached the sum of $1,037,536.30. This does not include interest paid

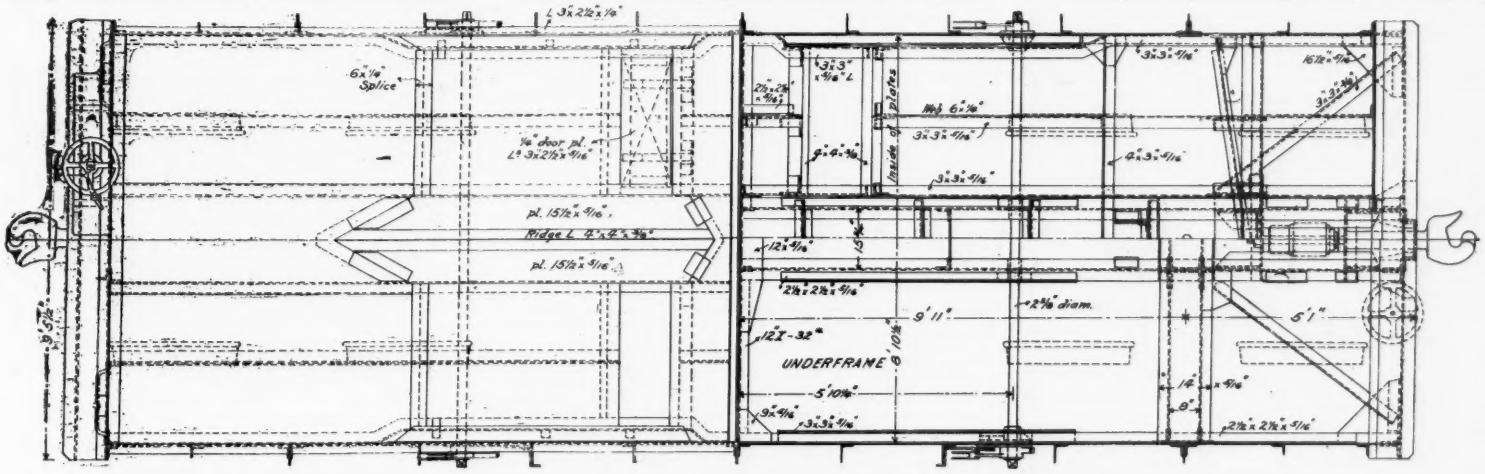


Fig. 5.—Half Plan, Showing Flooring and Half Sectional Plan.

by the company on the monthly balances of the Relief Fund, which has amounted to $113,643.98, nor the expenses in other departments of the service, incidental to the operation of the Relief Fund, and not shown separately.

During a part of the time a surplus was realized, which with accumulated interest amounts to about $300,000. This is to serve as a nucleus for a Superannuation Fund which it is hoped soon to establish.

The membership has steadily increased and now numbers nearly 38,000, being 55 per cent. of the employees and probably 80 per cent. of those eligible.

The great advantage to the contributors to this fund, arising for the systematic administration of needed relief, are scarcely to be measured even by the large sums distributed, and taken in connection with the substantial aid given by the corporation, this institution has shown itself to be a means of establishing a community of interest between the employer and the employed of inestimable value to both.

Railroad Legislation in Ohio.

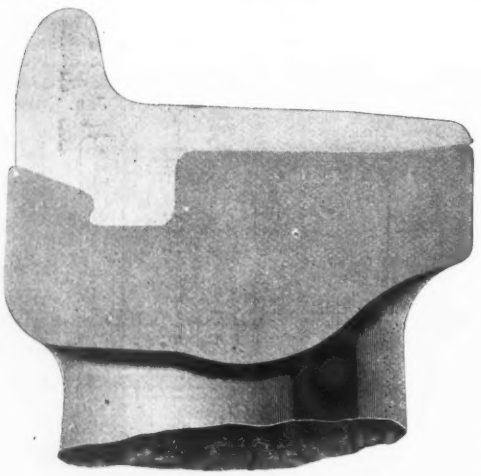
The Legislature of Ohio, which has recently adjourned, passed the following laws affecting railroad and transportation interests:

House bill No. 293 provides for an excise tax on railroad, street railroad, gas, water and other companies. The companies must file elaborate statements with the State Auditor annually. In the case of railroad companies the reports that they make to the Railroad Commissioner will be treated as reports to the Auditor. The State Board of Appraisers and Assessors shall examine all reports and determine what are the gross earnings of a company, which determination shall be final. In computing the gross earnings of an interstate railroad, they will find the average gross earnings per mile for the whole road, and multiply that by the length of line in Ohio. There is a penalty of $500 (and $100 a day for delay) for not furnishing an annual report. The tax on the street railroad, electric light, gas, pipe line, water, signal and messenger companies is one-half of one per cent. annually on the gross receipts, and on railroads one-half of one per cent. on the gross earnings from operation in Ohio, as computed on the basis named above. The act does not exempt companies from taxation on their tangible property as now provided by law.

Senate bill No. 49 provides for the taxation of freight line and equipment companies. A company operating cars but not a railroad is to be called a freight line company. A company leasing cars but not operating a railroad is to be called an equipment company. Such companies must make annual reports, giving the whole length of line over which they operate and the length in Ohio. The Board of Appraisers and Assessors shall determine the proportion of the equipment that should be taxed in Ohio, provision being made for review and correction of findings in case of necessity. The tax is one per cent. on the proportion of the capital representing the property owned and used in Ohio, after deducting the value of the real estate in Ohio which is assessed and taxed locally.

Senate bill No. 75 appoints a Board of Canal Commissioners to establish the boundaries and lines of canals, a similar committee appointed in 1894 having left its work unfinished.

House bill No. 332, which is a supplement to section 4,732 of the Revised Statutes, requires the destruction of Russian thistles, and any station agent or track foreman



Tire Worn to ½ Inch.

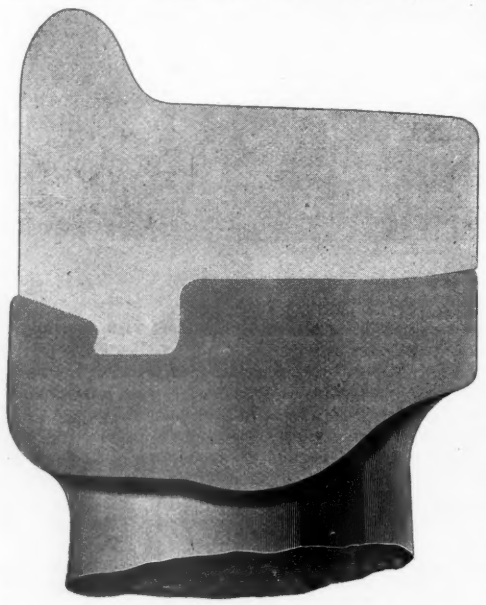
receiving notice of the existence of such noxious plants on the railroad right of way must destroy them within five days, on pain of fine of $25

House bill No. 483 prohibits the unlawful killing of quail and other birds, and forbids all persons to have in possession such birds with the intent to ship them to any point without the State.

Senate bill No. 195 authorizes Union depot companies to borrow money, without reference to the amount of stock of such company.

House bill 89 provides that where two or more railroads, either standard or electric, provide suitable interlocking signals at a crossing, or where safe signals are provided at a drawbridge, it shall be lawful for trains to run over without stopping. The Railroad Commissioner must approve the works, and a plan must be filed with him and in case he finds any signaling defective he may order it discontinued and trains must then stop as before. Where two or more companies wish to put in signals and cannot agree, the Commissioner, after a hearing, may decide what they shall do and apportion the cost of maintenance. Where a new company wishes to cross the line of an old one the new one must bear the whole cost. Refusal to comply with the Commissioner's order incurs a penalty of $500 a week.

H. B. No. 422, known as the Rogers bill, amends and supplements sections 2,505a and 2,505b of the Revised Statutes. The bill provides that any street railroad may lease another, two-thirds of the stock of each company agreeing. Dissenting stockholders are protected as in



Taylor's Welded Wheel with Interlocking Rib.

preceding laws on similar subjects. Where two such companies connect or may be connected they may consolidate. Whenever a consolidation is proposed, the city government may make certain agreements concerning the continuity of contracts previously existing between the roads and the city, provided the companies agree to transfer passengers from one street line to another in a manner satisfactory to the city; or the city may extend the franchises of roads when they consolidate, not to exceed 50 years, the new company agreeing to the above-mentioned condition about fares. There must be no increase of fare in any case nor any decrease in the tax payments to the city. The city may revise the fares and tax rates after 20 years and every 15 years thereafter. When a company is dissatisfied at such action of the city it may carry the case into court.

Senate bill, No. 211, amends the arbitration law of 1895.

Taylor's Steel-Tired Welded Wheel with Interlocking Rib.

The Taylor Iron & Steel Co. has recently brought out a modification of its car wheels made by fusing a steel tire to a cast-iron center. In the new wheel, as will be observed, the tire is provided with an interlocking rib which is designed to hold the flange in place even when the tread is entirely worn off. The three engravings show a section of a new wheel, of a tire worn to a thickness of half an inch and of a wheel with the tread of the tire completely worn off. The advantageous points in this wheel are summed up below:

It is really an interlocking section, making the tire an integral part of the wheel, even in case of imperfect fusion between the tire and cast-iron center. This makes it possible to use a steel of a higher temper in the tire if found desirable.

The interlocking rib is so located that it remains to support the flange after the steel in the tread is entirely worn out. Hence, as long as there is any steel in the tread, and the flange is not worn too thin, the wheel is safe and all the steel in the tread can be utilized. In evidence of this the first steel-tired welded wheel made and put in service was in the year 1869, when John K. Sax succeeded in fusing a steel facing only ⅝ in. thick to the tread and flange of a cast-iron wheel. This made over 80,000 miles under a coal car and was still good.

There are no bolts or retaining rings, and the cast-iron center is amply strong and of course cheaper than any other.

The history of the welded wheel during the past twenty odd years, in the use of nearly 60,000 (with less advantageous sections of tire) demonstrates its safety and economy. And this, notwithstanding the fact that in former years many of them were indifferently or carelessly made. In the old welded sections it has been common practice to wear the tire down to from ½ to ¾ in. in thickness, while in the new Taylor section all the steel in the tread becomes available for service with a still greater safety limit. This is the important advantage claimed for the new Taylor wheel. The ordinary tire will begin to elongate and loosen when the steel in the tread is reduced to 1 in. in thickness, hence with a 2½-in. tire only 1½-in. can be utilized for service when the wheel must come out for scrapping or retiring. But in the Taylor welded wheel, if Mr. Taylor's expectations are realized, when it is reduced 3 in. in diameter we shall have a wheel with ½ in. of steel still remaining in the tread and equal to at least two chilled wheels for freight or other service, or, say double the value of a scrap wheel, which will average for both built up and welded about $5 per wheel.

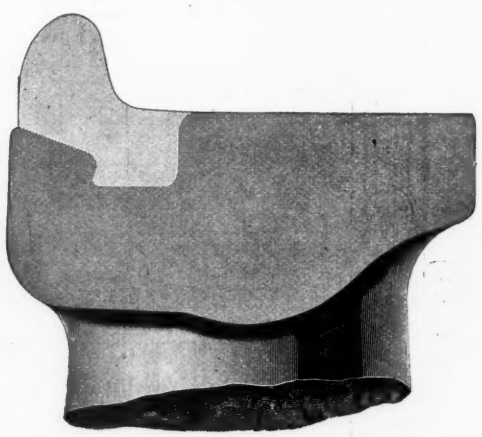
Among the large railroads already ordering these wheels are the Central Railroad of New Jersey, the Pennsylvania Railroad and the Delaware & Hudson Canal Co.

Taxation of English Railroads.

The amount of taxes paid by railroad companies, which has greatly increased in this country within the past dozen years, has also increased rapidly in England, and from the *Railway News* (London) which publishes a series of articles on the subject in its issues of May 2, 9 and 16, we condense the accompanying table. The railroads of England pay 12 times as much money in taxes as those of Scotland, and 28 times as much as those of Ireland. The articles in question describe the way in which the valuation is computed, which seems very complicated, the principle being to ascertain the profits earned by a railroad in each separate parish through which it passes. The actual results from the attempt to make such a calculation are, of course, in a large degree arbitrary. The gradual process by which the tax burden of the English railroads has been increased has been due chiefly to the pressure upon the governments, general and local, now for a long time well known, to relieve the financial distress of the agricultural communities,

TAXATION OF RAILROADS IN GREAT BRITAIN AND IRELAND - COMPARISONS BETWEEN 1879 AND 1894.

	Net revenue.				Taxes paid.				Per cent. taxes to net revenue.	
	1879.	1894.	Increase.		1879.	1894.	Increase.			
	£	£	£	P. c.	£	£	£	P. c.	1879.	1894.
London, Chatham & Dover	516 691	674.273	157,579	30	31,499	81 165	52,666	167	6.10	12.48
London, Brighton & S. C	1,066,812	1,270,511	203,699	19	62.516	129.140	66,624	107	5 86	10.16
South Eastern	1,028,586	1,115,888	87,302	8	77 065	131,566	54,501	71	7.49	11.79
London & North Western	4.519,324	5,192 652	673,328	15	198 552	329.451	130,896	66	4.39	6.34
Total, England and Wales	25,366,526	31.271,507	5,904,981	23	1,305 583	2,509,183	1 203.600	9	5.15	8.02
Total, Scotland	3,2:8,698	4 279 957	1,051,259	33	149,753	219,641	69,888	47	4 64	5.13*
Total, Ireland	1,136, 6	1,551.054	414,48	36	74,366	87,015	12,649	17	6 55	5.61
Total, United Kingdom	29,731,430	37,102,518	7.371, 88	25	1,529,702	2,815,839	1,286,137	84	5 15	7.59



Tire Worn Out.

we have lately had occasion to notice instances where a railroad pays a very large share of the taxes of some small town in which a portion of its line lies, but in which it does little or no business directly.

Progress in Steel Car Frames.

A committee was appointed last year by the Master Car Builders' Association to report on the progress and latest development in metal underframes for freight cars. A report made several years ago did not cover much ground nor was it especially important. The committee failed to have a full meeting, which indicated that this subject was not one in which railroad men

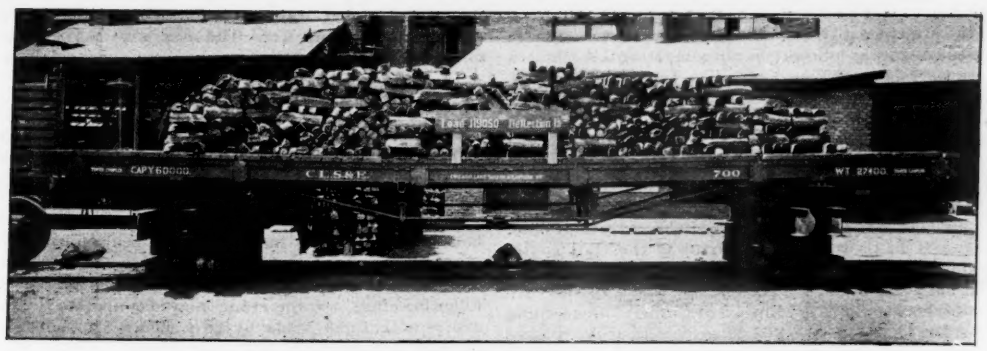


Fig. 1.—Harvey Steel Car, Load 119,050 Lbs.; Deflection, 1⅛ In.

were interested at this time. This year the report will be a long one and cover considerable ground. The committee has been reduced by the absence of several of the members, so that the work has fallen almost solely on Mr. R. P. C. Sanderson, of the Norfolk & Western Railroad. Mr. Sanderson's first plan was a very comprehensive one, but it had to be modified owing to some unfortunate accidents, among which was the loss of many papers in a fire. The different car builders and manufacturing firms who have taken an interest before this in metal parts for cars have shown a willingness to help in this work and have sent the committee some useful information. Most car builders feel that the time is near at hand when there will be some practical trials on a large scale of metal underframes and this has set them to looking about for a such designs and plans of manufacture as will give a cost as little as possible above that of the best class of wooden underframes.

Naturally the makers of rolled beams see much new business in metal underframes, as the material used in one year, if all freight cars had metal frames, would be considerable. For this reason, among others, the North Chicago Rolling Mills of the Illinois Steel Co have been leased by the Universal Construction Co., to build, among other articles, metal cars and trucks. The President of this company is Mr. W. R. Stirling, well known as having been for many years the first Vice-President of the Illinois Steel Co. The rights to build cars under the Harvey-Pennock patent and other patents have been secured. They are now making several of the Pennock flat and hopper cars from new designs; one or more of the flat cars will be exhibited at Saratoga.

This company is the first to take up the construction of metal cars complete in one establishment. In one department the ore is made into rolled sections and in another the rolled sections are joined together to make metal car frames. This plan gives the possibility of low cost and prompt delivery, as there will be but one profit and no delays in waiting for material. The management is a conservative one and all the experience so far had with metal underframes in this country and in Europe has been gathered together for the guidance of the engineers of the company.

One of the most important of the pieces of useful information gathered is that relating to some Harvey and Pennock cars which have seen considerable service. Several of these cars have been brought to the works for examination and test. The design of the Harvey car thus examined is that described in the *Railroad Gazette*, Feb. 26, 1892. This car was built in 1892 among others for the Calumet & Blue Island Railroad. It has been in exceedingly severe service carrying heavy loads of iron and has made up to this time about 60,000 miles carrying a total of 29,560 gross tons of freight.

Much of the service has been switching on transfer tracks about Chicago, which is the hardest service to which cars are ordinarily subjected. The car is in excellent condition for further service and shows but little the effect of a corner collision which it received some time ago. Without setting up the truss rods or making any changes, the car was loaded with 119,050 lbs. of pig iron, as shown in Fig. 1. This gave a deflection of 1⅛ in. at the center. A load of 120,000 lbs. was then distributed as shown by Fig. 2, after which the deflection was but ½ in. at the center and ¼ in. at the ends. This load remained upon the car from May 22 to June 5, inclusive, and upon being taken off the permanent set was almost imperceptible.

Mr. W. G. Brimson, President of the Chicago, Lake Shore & Eastern, which now controls the Calumet & Blue Island Railroad, reports that the 30 box and the 20 stock cars of the Harvey type, purchased in 1893, have been in continuous service, and no repairs have been made up to this time except in the case of three cars which were in wrecks and were repaired without difficulty with the ordinary tools found at car-repair points. The Harvey design, being very light and still in good condition after such severe service, gives important evidence of the practical durability of metal underframes.

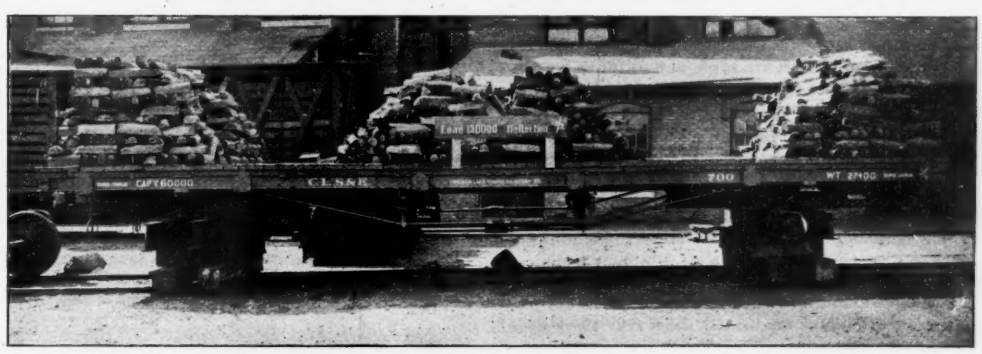


Fig. 2.—Harvey Steel Car, Load 120,000 Lbs.; Deflection, ½ In. in Center; ¼ In. at Ends.

The Pennock car built in May last year has been used in transporting pig metal at the works of the Carnegie Steel Works in Pittsburgh. This is very severe service and the car after one year is in as good condition as when new. This car was illustrated in the *Railroad Gazette* Nov. 29, 1895.

At the works of the Universal Construction Co. this car has been tested by pig iron as follows: A load of 126,400 lbs. gave a deflection of 1 in. at the center. A load of 140,000 lbs. between bolsters gave a deflection of 1⅛ in., see Fig. 3. With a load of 159,200 lbs. with 45,000 lbs. at each end and 69,000 at the center gave a deflection of ¼ in. at one end, 3/16 in. at the other and ⅝ in. at the center, see Fig. 4. There was no permanent set. These tests were made by supporting the car upon beams at the center pins as no common truck could stand such a load. It is contemplated that some collision tests will be made showing the comparative effects of a severe collision on the Pennock and wooden underframes. If these tests are completed in time, the photographs of the cars before and after the collision will be among the exhibits at Saratoga.

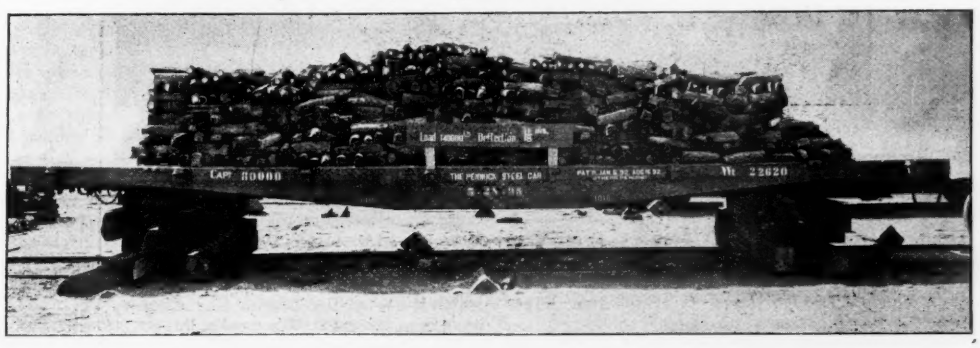


Fig. 3.—Pennock Steet Car, Load 140,000 Lbs.; Deflection, 1⅛ In.

It is the intention of the Universal Construction Co. to put on the market metal underframes and trucks, for all classes of cars at such prices and increased carrying capacities as will make them attractive to railroads. Outside of the greater durability and increased strength, they will offer the important advantage of a line of cars that will shorten considerably the length of trains and decrease the dead weight hauled for a given useful load.

Some of the Engineering Schools.

We have received within a few days the annual "Registers" of several engineering schools, and looking them over we are again struck by the wonderful opportunities which the modern American boy has for getting an education which will fit him for working in some branch of the engineering profession. From the list of members of the Society for the Promotion of Engineering Education we discover that there are in the United States about 45 schools where one can be educated as an engineer, more or less completely. Of course there are still others, but we speak only of those represented in that Society. Among these there are half a dozen of which it would be hard to say which one of them is the best, taking all things into consideration. There are about 10 which rank in the world as great engineering schools, not by virtue of the numbers in attendance so much as because of their equipment and methods. There are perhaps 15 (including the above), so good and so thoroughly organized and equipped that the boy who can take four years at either one of them need not fear any competitor—natural gifts being somewhat equal. There are a great many so good that the boy who has a chance to get an engineering education at either of them ought to think himself uncommonly lucky. And these 45 schools are scattered all over the United States, from the Atlantic to the Pacific. But we propose now to give only a few facts from the catalogues which started these reflections.

The Worcester Polytechnic Institute was founded in 1865. The catalogue of 1896 shows that it has now 199 enrolled students, of whom four are graduates pursuing special courses. Much the greater part of these students come from New England and, indeed, from Massachusetts. Thirteen states of the Union are, however, represented in the list as are five foreign countries. The published list of graduates shows 686 names, or 51 per cent. of those who entered the Institute. Of these graduates 600 are now living, and the Register, which gives the present occupation of these graduates, shows that most of them are following some branch of engineering or some business closely allied. Without making an analysis and comparison we should say that at least as large a proportion of the graduates of this institution follow some branch of engineering as of the graduates of any other of the technical schools.

We suppose that there is a pretty wide misconception of the character and scope of this institution—that a great many people still look upon it as a kind of large manual training school. We are informed by the Register that in the idea of a workshop as an essential part of the training of the mechanical engineer this institution was the pioneer in this country, and we have long supposed this to be true. But the workshop is only

Fig. 4.—Pennock Steel Car, Load 159,200 Lbs.; Deflection at Center, ⅝ In.; at Ends, ¼ and 3/16 In.

an incidental part of the course of instruction. Within a few years the courses of study have been enlarged and extended, the facilities for instruction have been more than doubled, and it is believed by those who are responsible for the conduct of the institution that its courses are not inferior to those of any other engineering school, considered as a means of intellectual discipline, or for the production of the technical expert. The students now in the institution have their choice of four years' courses in mechanical engineering, civil engineering, electrical engineering, chemistry and a general scientific course. In electrical engineering there is a fifth-year graduate course. The shops and laboratories of the institute are quite complete. They include the Salisbury laboratories of physics and chemistry, the Washburn shops, a new engineering laboratory now nearly completed, a power laboratory to be occupied for the first time this year and an experimental hydraulic plant built "on a scale hitherto unapproached by any institution of learning in the country." This hydraulic testing plant is about 4½ miles from the Institute and has a water privilege with 30 ft. head furnishing about 80 H. P. for most of the year.

The ruling idea in the mechanical work is that of actually constructing and using machinery. The students during the course make all the parts of some tolerably complex machines which they assemble, put into operation and run, thus getting an idea of the commercial value of the machine which they have built. Laboratory or work shop practice occupies at least 10 hours weekly throughout each course and in addition each course requires 590 hours of vacation practice. The requirements for admission are high, and so far as we can judge from an examination of the Register, from seeing the institution, its faculty and students, and from the standing in the world of its graduates we feel justified in saying that this institution has a high rank in the honorable list of technical schools of the country.

Concerning the standing of the *Massachusetts Institute of Technology* and the work done there nothing need be said, as this is one of the most famous technical schools of the world. The registration as shown by the 1896 catalogue amounts to 1,187 students. Of these 60.7 per cent. are from Massachusetts. Last year there were 1,183, and the year before 1,157. Ten years ago the students numbered 609, 20 years ago 255, and 30 years ago 72. Sixty-one of those who were admitted on examination at the beginning of this collegiate year have not joined, and exactly the same number who had passed their examinations failed to join last year. The explanation of this is that some found themselves heavily conditioned and were discouraged; others used the certificates of admission to other colleges; others found that they could not raise the money to carry them through, and finally "others are kept away by the ordinary accidents of life." Of the 239 who were admitted on examination and have joined the school, 175 were admitted clear, 43 with one condition, 18 with two conditions and three with more than two; which seems to us a pretty high percentage of conditions, although we do not know how this compares with other institutions of the day. But the facts that so many freshmen entered with conditions, and that probably not more than half of those who enter graduate, suggest the very hard pace which is now set in the higher technical schools. Indeed we have often thought that the boys are worked too hard.

We have said that the total number of students enrolled is 1,187. Of these the regular students in the second, third and fourth years are 575. The favorite course among these is electrical engineering, there being 126 in that course. Next comes mechanical engineering, 118; then civil engineering, 88; architecture, 67; chemistry, 59; mining engineering, 25; chemical engineering, 25; naval architecture, 22; general course, 14; physics, 11; sanitary engineering, 10; biology, 7, and geology, 3.

Summer schools in the field are part of the instruction of the Institute. One of these is of mining engineering and metallurgy. Last year the school of metallurgy visited various works in New Jersey and Pennsylvania. The summer school for geodesy, topography and hydrographic engineering was held during June at Keeseville, N.Y. Twenty students were in attendance. They made a plane-table survey of a considerable area, remeasured a base line and the angles of the triangulation system, made soundings and temperature observations in Lake Champlain, established a true meridian line, made time and latitude observations and did considerable hydraulic work in the way of stream gagings. The summer school of architecture was held at Salem for a special study of colonial architecture, with 17 students. A number of summer courses are carried on at the Institute.

Professor Swain says that "the demand for graduates in civil and sanitary engineering during the past year has been unusually large. . . . There is a steady and increasing demand for more men than the school can supply. Last June 28 men graduated in the departments of civil and sanitary engineering. All of these were employed and many had several opportunities which they were obliged to reject."

The engineering schools of *Cornell University*, like the Massachusetts "Tech," need no general introduction. In the number of students enrolled, in the faculties and in laboratory equipment, Cornell stands in the first rank. We find by the 1896 Register that the whole number of students in the University now is 1,657. Among these are 177 graduate students. Fifty-nine per cent. of the total enrollment is from the State of New York. The students in the present registration assigned to various engineering courses are as follows; but in comparing these figures with those of the "Tech," one must bear in mind that the figures given for the Institute of Technology cover students in the last three years of the course only; those of Cornell include four years. At Cornell, as at the "Tech," electrical engineering leads, the number of undergraduates being 293. Mechanical engineering is next, with 200; civil engineering has 119, architecture 66 and science 146. We published quite recently (March 20, page 198) the record of the graduates of the civil engineering school.

It has been hoped for a good while that a special railroad school could be established at Cornell. Concerning this, Dr. Thurston said, in a paper published about three years ago: "Our long hoped-for graduate schools of locomotive and railway engineering, perhaps having the broadest of all fields of application in this country, remain still to be organized. For this we need $100,000 to $150,000 in buildings, equipment, and materials and endowment or an assured income, giving us not less than $10,000 a year, and we could spend, probably, still more profitably, two or three times that sum. Once organized, it is very likely that the railroads, seeing what advantage its operation would have for them, would do much to sustain and promote its work." Very little has been done towards carrying out this design. Among the instructors are some who have had experience in locomotive shops and in other railroad work, and they give lectures and special instruction in the drafting-room in designing locomotives and other railroad machinery. Proposals have been received from builders to supply the University with experimental engines, and officers of the Delaware, Lackawanna & Western, and of the Lehigh Valley, promise to give considerable aid in carrying on the railroad work when the school is organized. The project is delayed now only for want of money. The University is crippled in extensions by the fact that the state compels the instruction of 600 students, costing perhaps $180,000 a year, toward which it contributes only about $20,000. It is believed that this unjust arrangement will be brought to an end, and that then the University can go on in new and important departments.

Columbia College—The strictly engineering schools of Columbia University have long been under the Faculty of the School of Mines. The name of this has now been changed to the "Faculty of Applied Science." This Faculty administers the recently created School of Engineering, School of Mines, School of Chemistry and School of Architecture. The internal administration of affairs is in no way changed. In the University, courses are given in civil engineering, electrical engineering, mechanical engineering, mining engineering, metallurgy, geology and palæontology, analytical and applied chemistry and architecture, besides the courses in law, medicine, arts, political science, pure science and philosophy. The total enrollment in the University this year is 1873. The total number of students registered primarily under the Faculty of Mines is now 370; the total pursuing studies under that Faculty is 378.

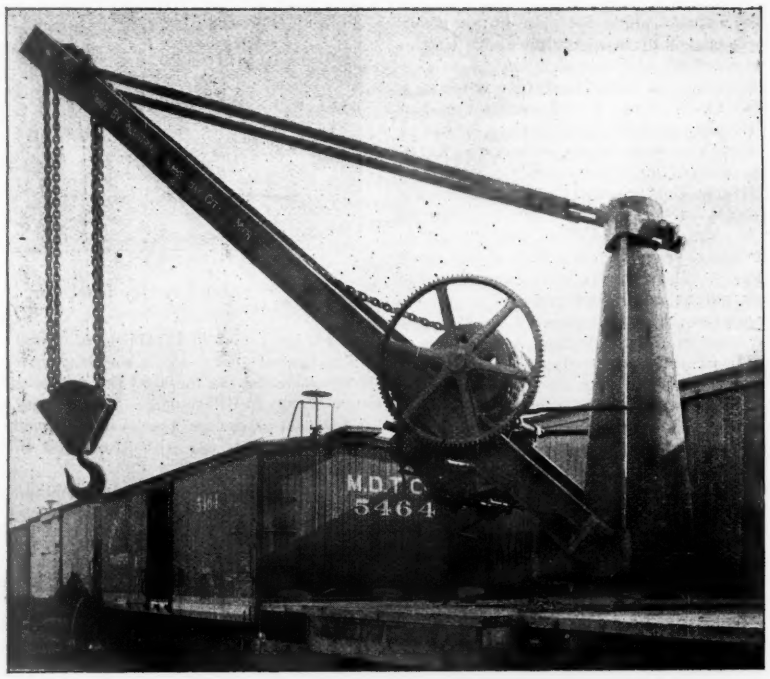
The engineering courses include several summer schools. In civil engineering there is a summer school of surveying, attendance on which aggregates 16 weeks, spread over three summer vacations. In mining engineering there is a summer school lasting five weeks. Then, in this, there are also graduate courses. The University is well equipped in laboratory apparatus, as well as in its faculty, for engineering instruction, and the plan on which instruction is carried on is a very high one. The fundamental idea is to ground the students thoroughly in principles and give them a broad and thorough training which will fit them to differentiate into specialties hereafter. The aim is to make them sound scholars rather than mechanicians or specialists.

Thirty-Ton, Railroad Yard, Pillar Crane.

The engraving shows a recent design of large capacity Pillar Crane made for the Michigan Central Railroad freight station at Chicago, Ill., by the Industrial Works, Bay City, Mich.

In this machine, with the large weights necessary to be hoisted and slewed by hand, careful attention has been given to the reduction of friction in all working parts. All bearings carrying loads are provided with hard steel roller bushings, and the crane may be operated very easily with light loads by two men. The hoisting mechanism is an accurately running train of steel and iron gearing provided with self-sustaining brakes and ratchets. There are two speeds of hoist for light and heavy loads.

The base and pillar are cast in one piece, mounted on and anchored to a very substantial masonry foundation. The Industrial Works build cranes of this and the transfer type in capacities from 5 to 30 tons.



Thirty-ton Pillar Crane—By the Industrial Works.

Foreign Railroad Notes.

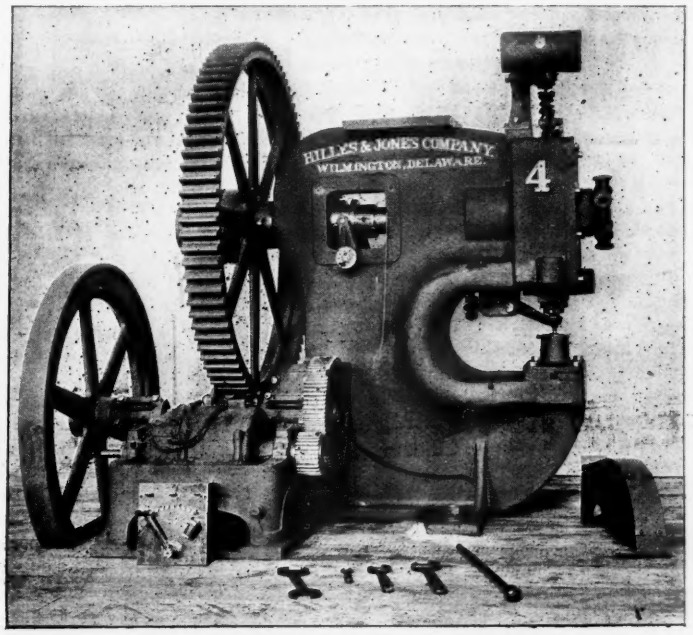
The railroad from the Mediterranean, at Beyrout, eastward to Damascus, was opened Aug. 3, 1895. The line is 77 miles long, more than half with a cogged rail to climb the hills. The train requires nine hours to make the run and cannot carry more than 55 tons of freight, one of the consequences of which is a freight rate of nearly eight cents per ton per mile. The engines and tenders are so small that they have to take on water every 2½ miles. The passenger fares for the 77 miles are $1.80, $3 and $5, for the three classes respectively, in spite of which the cars are usually well filled. The freight traffic also is about as great as the road can handle, which is not saying much. The gross earnings so far have been about $40,000 a month, but $30,000 a month is required to pay interest on the bonds. Traffic was interrupted by snow some three weeks in the winter. The same company owns a line from Damascus to Mesrib, which has been open a year longer than the Beyrout line, but has so little traffic that only two trains a week are run, and the earnings are much less than the working expenses. It was supposed that it would have a large traffic in grain from a fertile district called the Hauran; but the Hauran grain continues to go to market on camels' backs.

Plans have been made for extensions of the Trans-Caspian Railroad, and *Herapath's Journal*, in a note on the subject, thinks that the English would do well to keep an eye on this scheme instead of devoting their attention so exclusively to the alleged designs of Russia in Manchuria. It is now intended to build two branches from the Trans-Caspian line, almost into Afghanistan. The first branch starts from Merv and ends at Khusk, only 94 miles from Herat. The other branch runs along the Oxus to Charjui, within 30 miles of the Afghan frontier. Both these lines will possess great economic and strategic value for Russia. The first named runs through a fine grain producing region. The note ends with an admonition to England to go and do likewise on the Indian frontier.

The Breslau (Prussia) Car-Building Company in 1895 turned out 176 post-office and passenger cars of the average value of $2,385 each, and 1,461 freight cars of the average value of $497. The freight cars were probably of 15 tons capacity. The company's profits were nearly 10 per cent. of the value of its output, and it paid a dividend of 10 per cent.

A Heavy Punch, Electrically Driven.

The engraving shows a standard No. 4 single punch or shear, designed and built by Hilles & Jones Company, Wilmington, Del., and arranged for direct electric driving. The tool has a 20-in. depth throat. The main frame is of the box form, which gives the greatest rigidity with the least amount of metal. The capacity of the machine is equal to punching a hole 2-in. in diameter through 1¼ in. thickness of plate. The clearance hole in the nose is 6½ in. in diameter; and all the attachments, such as knife blocks, die blocks, etc., are made with through ream bolts so that the machine can be changed from a punch to a shear, or vice versa, with the least possible delay, and without wearing the main casting. The driving, as will be noticed by the illustration, is by means of an iron-clad motor driving through a pair of cut gears on to the main fly-wheel shaft. This method of construction takes up but little additional room, and is a very satisfactory method of construction, doing away with the pulleys and belts, making it possible to set a machine of this design in the middle of the shop without interfering with traveling cranes, and without the necessity of running expensive shafting. Such a tool can also be placed in the yard, entirely away from the ordinary motive power, and connection by wire will operate it with entire satisfaction. Machines of this general design of any required capacity from 5 in. depth of throat to 72 in. depth of throat, are furnished from standard patterns of approved dimensions.



Electrically Driven, Single Punch or Shear.

A Light Self-Proelled Car.

The Kalamazoo Railroad Velocipede & Car Co. has recently shipped to the Press Company, of Philadelphia, a special car of the steam inspection car variety. It is not, however, intended as an inspection car, but for carrying papers. It has a capacity for 3,000 lbs. of papers and is to run between Portland and Easton, Pa., over the Bangor & Portland Railroad. We give an engraving of this car reproduced from a photograph and a description follows.

The motive power is a 10-H. P. boiler, and two upright, reversible engines, with balanced valves of 5 H. P. each. The boiler is furnished with all the usual appurtenances for safety and convenience, including pop valve, steam gage, Pemberthy injector, whistle, blower, etc. Soft coal is used for fuel. The boiler consumes about 2½ to 3 gallons of water and 6 to 8 lbs. of coal per mile when running on level track with conditions favorable.

The engines are connected to the driving axle with two sets of cut gears, operated by friction clutch, one set for speed, the other for starting and climbing heavy grades. The frame of the car is 5 ft. 9 in. wide by 20 ft. long, provided with a gas-pipe frame or rack suitable for carrying 3,000 lbs. or more of papers. It is also furnished with a seat for three or four passengers, also a pilot and headlight.

The two driving wheels are 27 in. in diameter, and the four truck wheels 20 in. diameter. This car is guaranteed to carry a load of 3,000 lbs. at the rate of 30 miles an hour on track where grades do not average to exceed 1 per cent. It can be run on level track on the fast gear at the rate of 35 to 40 miles an hour, which is as fast as a person of ordinary courage cares to ride on these comparatively light cars. The car, loaded, with fuel and water, ready for a trip, weighs 7,500 lbs. It is also furnished with a steam siphon so that the tank can be filled with water from a creek or stream 30 ft. or more away.

Emergencies in Railroad Work*

BY L. F. LOREE, M. AM. SOC. C. E.,
General Manager Pennsylvania Lines.

An emergency, as defined by the Century dictionary, is a sudden or unexpected occasion for action—a perplexing contingency or complication of circumstances. It may readily be believed that in a business so extensive, so diversified and so complicated as is that of transportation, emergencies might be expected. . . . I have selected for discussion as being in the line of your training and likely to come within your early experience, if you elect to follow this business, the emergencies of wrecks, washouts and strikes. . . .

If I have seemed to emphasize the matter of commissary it is to be remembered that no less an authority than Davoust has said, "The success of an army depends very much upon the efficiency of its commissary." As the army exists for the handling of emergencies we may well take a lesson from the book of its experience.

Wrecks.—I can only point out here to what wrecks are due and what means have been and are being adopted to prevent them.

Much has been done to lessen both the number and destructiveness of accidents by improvements in the roadbed, bridges and track, in the construction of engines and cars, in the adoption of the Miller platform, couplers of the Master Car Builder type, the Westinghouse air-brake, interlocking apparatus, and signaling devices. Just now we are going in strongly for block signaling and bid fair to overdo it. After all, we have in every operation to fall back on human agencies, and it must occur to the most casual observer that we can best improve the service by improving the discipline. As these tables indicate, and as Mr. Haines, the President of the American Railway Association, never tires of pointing out, "the lack of unquestioned obedience to authority and of prompt compliance with established rules is at the bottom of more railway accidents than all other causes put together."

But now the wreck having occurred, the main track obstructed and traffic interrupted, let us see what steps are taken in the emergency. . . .

Where there are three or four running tracks, and in or near cities where the right of way is covered with tracks and there is no place to deposit the debris, thus making it necessary to load up and move away the wreckage to dispose of it, or at least to move it off to an adjacent place, and that without greatly disturbing the adjoining tracks, which it is desirable at once to bring into active use for the movement of traffic, a steam derrick is likely to prove not only the most effective but the most economical appliance to employ. This is especially true because at such points there are usually massed men and machinery. But in the operation of double track, and especially on single track, where the wreckage can be rolled off to either side, it is probable that the track can be quite as speedily cleared by the use of jacks and block and tackle as by any other method, and the use of a steam derrick, which under such circumstances would be a costly and cumbersome machine, should be avoided. Where the train works on either side of its station the derrick car should be equipped with a derrick at each end to avoid the delay from turning the car. The style and capacity of wrecking derricks have not kept pace with the rapid and great increases in the size and weight of cars. There are but few in use that are well adapted for the work they have to do.

A good hand derrick should meet the following requirements:

1. Car to be 34 ft. long.
2. To have a derrick at each end.
3. Derrick to have curved boom.
4. Derrick mast to be turned by gearing.
5. Derrick to have a lift of 12 ft. from top of rail, to have a reach of 15 ft. from center of car, the center of the mast to go over the center of the truck and to be set back 7 ft. from the end of the car.
6. Derrick to have a maximum capacity of 15 tons.
7. Derrick to have two speeds for lifting.
8. To be equipped with wire cables for lifting with hand power or with locomotive power.
9. Car to be provided with swinging iron side arms or jack arms, so that derrick can be operated to its full capacity, working off the side of the car.
10. Car to be provided with screws on the axles for leveling its deck when working on curves.
11. Derrick to have adjustable counter weight, so that it may lift the heaviest truck in service, and be moved about on the track either on tangents or curves while carrying truck

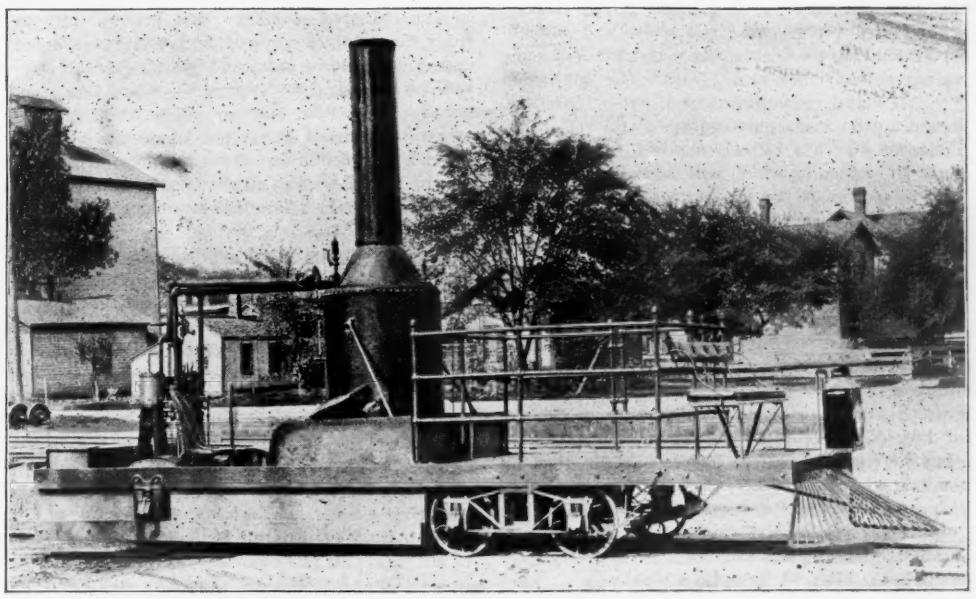
We have found it convenient to have a crew consisting of a foreman and 12 men. These men are employed about the shops where the car is kept and work at car repairs. Should one for any reason desire to absent himself from his duties, permission is first obtained of the foreman, who designates another to fill the vacancy, so that a full complement of men is always assured. Should the wreck occur during working hours the crew is, advised of it by whistle signal, if at night by electric bells located in their homes.

There is a similarity between the service of the wreck train and that of a city fire department. The value of the service is greatly dependent upon the quickness with which the apparatus is got on the ground. So when the signal sounds every man hastens to his place, the most available engine and crew are pressed into the service regardless of their previous engagements, once started they are given a clear track to the point of obstruction, other trains scurry in on the lie-bys very much as travelers seek the sidewalks and teams the curb as the ringing of the fire gong announces the approaching truck. Arriving at the wreck a telegraph office is hooked up, the train wire cut in, and communication established with headquarters. A man is left in charge of the tool car, who issues the tools as they are called for, and cleans and puts them away in order as they are returned. He also keeps the coffee pot boiling and serves up a luncheon of biscuits, tinned meats, etc. Again, as at a fire, the chief effort is to prevent its spread, so here the effort is not so much to save the damaged cars as to clear the line for the movement of traffic. Nearly everything is rolled down the bank, the picking up is postponed to

(*Continued on page* 417.)

RELATIVE FREQUENCY OF DIFFERENT CLASSES OF MAIN TRACK ACCIDENTS, C. & P. DIVISION, PENNSYLVANIA CO.
July 1, 1892, to Dec. 31, 1894.

Character of Accidents.	No. of accidents per one million train miles for the period.	Train miles run to one accident.
Rear collisions	.77	1,304,839
Butting collisions	.92	1,087,765
Break-in-two collisions	2.62	383,776
Crossing and miscellaneous collisions	1.69	590,835
Total collisions	6.	167,287
Derailments from		
Defects of road	.77	1,304,839
Defects of equipment	7.69	130,483
Negligence in operating	2.31	434,946
Unforeseen obstruction	1.08	932,027
Unexplained	1.39	724,910
Total derailments	13.24	75,862
Accidents without collision or derailment		
To locomotives	.30	3,262,096
To cars	1.08	932,027
Cars burned while running		
Other causes	.46	2,174,731
Total accidents without collision or derailment	1.84	541,683
Total train accidents	21.08	47,642
Total train mileage in millions	2.6	



Special Self-Propelled Car by the Kalamazoo Railroad Velocipede & Car Co.

* Extracts from a lecture delivered before the students of the College of Mechanics and Engineering, University of Wisconsin, March 22, 1895. Published in the *Bulletin* of the University of Wisconsin.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

On Thursday of last week certain officers of the Manhattan Railway, New York, appeared before the Rapid Transit Commissioners to explain their plan for extending the lines of their system and for improving the existing lines. The main result of the conference was that the Manhattan officers agreed to put their proposition in writing and make a formal application to be presented on Thursday of this week. The extensions proposed are given in detail in another column. The plan is essentially that proposed in January, 1893, with some modifications. In brief, new lines would be built at once on the upper end of the island and in the "annexed district" and on the west side of the lower end of the island, with one or two short cross lines. Additional tracks would be laid on the principal existing structures, except on Sixth avenue. We do not see why these improvements, if they could be carried out, should not fill the needs of New York for rapid transit for some years, and surely it is for the public interest that the Board representing the public and the officers representing the Manhattan system should come to an agreement which would insure the Manhattan extensions being promptly carried out. There are, however, a good many public-spirited and well-meaning citizens who are bitterly opposed to any settlement of the difficulty which will increase the territory or the power of the Manhattan, and these citizens find ample encouragement in several of the daily newspapers. The immediate outcome is still difficult to forecast and we shall not run the risks of prophesying.

The decision of the Supreme Court of the United States sustaining the law of Georgia forbidding the running of freight trains in that state on the Sabbath day was reported in the *Railroad Gazette* of June 5. That decision says nothing about the application of the law to passenger trains, but it appears that an amendment to the law, adopted Sept. 27, 1883, brings within its prohibition "excursion trains or other than regular trains run for carrying mails or passengers"; and an excursion over the Southern Railway from Birmingham, Ala., to Atlanta, which was to have been run last Sunday, has been abandoned in consequence of the Supreme Court decision. It is a nice question whether Judge Harlan's decision would or would not sustain the clause forbidding excursion trains, but the Southern Railway is evidently not disposed to risk the cost of a suit and determines to give the real or supposed public sentiment of Georgia the benefit of the doubt and so changes the time of its proposed excursion. Judge Harlan based his decision on the right of a state to legislate for the benefit of the public health, morals, peace and order (such a statute being a police regulation), this not being an interference with interstate commerce as long as Congress has taken no action which this statute conflicts with. It would seem to follow from the general tenor of the decision that if Georgia, or any other state, should see fit to forbid all trains on Sunday, the Federal Government would not be able to run even a mail train through the state on that day unless Congress passed an act specifically authorizing such trains.

The New East River Bridge.

The commissioners of the new East River Bridge gave public hearings in New York and Brooklyn this week on the matter of the terminals of the new bridge. The Brooklyn terminal is, we believe, practically settled. With regard to the New York terminal there is a difference of opinion in the Commission itself, two quite different plans being favored.

From the New York anchorage the prolongation of the line of the bridge is south of Delancey street, and parallel with it, running west by north. One proposition is to carry the approach on this straight line about seven blocks beyond the anchorage and then turn a right angle and continue southwesterly a block and a half to Grand street, coming to grade at the northerly side of Grand street. The other proposition is to go on in a straight line three or four blocks further and come to grade about Clinton street, making a broad plaza extending two blocks further to Norfolk street.

Of course there is something to be said on both sides, but so far as we can see the only really important reason for turning the right angle into Grand street is that this approach would be somewhat cheaper; how much cheaper, we have no idea; but we will assume for the moment that the whole enterprise is to cost 12 million dollars and that the Grand street approach could be made for a quarter of a million dollars less than the straight approach by Clinton street. Obviously, the difference in the cost of the two approaches becomes a very minor consideration if there are important differences in other particulars. It seems to us that there are very important differences.

The Grand street approach has two great objections. The first is that the street car tracks turn a right angle on a grade. This introduces a working difficulty. Speeds must be reduced or there will be constant danger of accidents on this curve. Of course working expense is also increased for the whole period of the life of the bridge, by the fact of having to haul the cars around the curve. But another point, and a still more important one, is that the traffic of a highway 118 ft. wide, carrying street car tracks, roadways and sidewalks is to be disgorged into another highway 70 ft. wide, already well occupied. If the new bridge does business enough to warrant the cities in building it, the congestion at such an entrance as this would be intolerable. The meeting of the streams of trucks, wagons and foot passengers during the busy hours would be so objectionable that before many years they would have to be separated by some plan of separating the grades. Moreover, from the point of view of architectural effect, this approach would be mean and inconsequential as compared with a straight approach leading away from a broad plaza. Still another objection to the Grand street proposition is that the whole tide of traffic is abruptly turned away from the greater part of the city of New York and all that traffic bound west and north must make a détour to again get into its proper course.

The plan for a straight approach ending in a plaza near Clinton street lends itself to a splendid architectural effect, which is a matter worth a great deal of consideration. As a spectacle the Brooklyn Bridge viewed from the ground before either entrance, is certainly not creditable to the engineers or architects of our country. From the traffic standpoint the Clinton street plaza approach has the advantages that the approach is in a straight line and that the traffic of all sorts, instead of being congested, would be distributed on the plaza and from it through numerous radiating streets. A further suggestion of great merit is that, eventually, a diagonal avenue should be cut from this plaza northward to about the junction of Third and Fourth avenues, making a noble approach to the bridge from all the northern part of the city and adding immensely to the value of the real estate in that whole quarter. This latter suggestion is, however, no part of the present business of the commissioners.

There seems to be a chance in this matter of the approaches for the commissioners to make a great blunder, or to make a decision that will add to the convenience of the people and the renown of the cities for all time to come.

The Interstate Commerce Commission.

The people of the United States expect great things of the Interstate Commerce Commission. This is right, for the Commission was appointed to deal with a great subject. But the problems encountered were very difficult, the action of the Commission has often been very incomprehensible to everybody except experts in transportation matters, and public sentiment has much of the time been greatly confused, not to say chaotic; and the following paragraph from a recent editorial in the *Journal of Commerce* (New York), probably expresses the view of many editors and legislators:

> "A point has been reached in the history of the Interstate Commerce Commission, where it becomes necessary to inquire what can be done to make it the kind of body which Congress designed it to be and which the interests of commerce urgently demand. Nine years is a long time to spend in determining what is the legal scope of the authority of the Commission."

In its remarks leading up to this, the *Journal* says that all the shipper has gained, in addition to his former legal rights against carriers, is the privilege of getting the Commission to back him up in any demand he may make; and reference is made to the superior results accomplished by the English Railway Commission.

The answer to the above-quoted inquiry is quite simple, though it is not a simple thing to do what the answer indicates. If we take Congress at its word—the letter of the law—it is fair to say that the Commission *is* such a body as it was designed to be. If it can efficiently back up shippers in their just demands against the railroads it will be doing a great work. The guarded language of the act is clear evidence that an advisory board like that of Massachusetts, and not a board with absolute powers, like that of Georgia or Iowa, was what was intended. The work of the Commission within that limitation has done a great deal of good. It has done good by clearing up facts and placing important questions before the public, even where its opinions have been unsound.

The Commission got an unfortunate twist at the outset. All the members were lawyers, and they assumed so many of the outward characteristics of a court that people thought the Commission *was* a court, and the error has colored the opinions of the public ever since. Dissatisfaction with the results of the Commission has been further fostered by the feeling that, whatever the law *said*, the intention was that the Commission should actually correct all objectionable rates in some way or other. This was not a wholly illegitimate feeling. The Commission was empowered to employ conciliation ad libitum, and conciliation was known to be, under some circumstances, a powerful weapon; but all the laws or commissions in the world could not meet the conflicting demands of American shippers, and so it finally came to be seen that the Commission was unable to do what was hoped for.

To make the Commission "what Congress designed it to be," that is, a body which would do everything possible to make railroad rates equitable as between all citizens, the first thing would be to appoint a well-known, high-minded expert to each of the five commissionerships. The present members were appointed largely on territorial considerations, and they are handicapped by the fact that their decisions, however meritorious, do not carry weight because, the questions being intricate and obscure, people cannot themselves judge of the soundness of a decision, but must depend upon the known character of the man; and the broadest minded men on the board do not enjoy national reputations.

But even with an ideal commission we should not have so good a machine as England's, for she has *two* boards; the Board of Trade, as an investigating body, and the Railway Commission, as a judicial body; and in both of these the traditions followed in selecting men, and the larger salaries paid, permit the employment of more competent men than we are likely to get in this country. Who can expect five men, working for moderate salaries, with temporary tenure, and temptations to indulge political ambitions, to be *both* good advocates and impartial judges at the same time? The way for this country to imitate England, or to get the benefit of her real or supposed superior methods, would seem to be too clear to need pointing out; the question is, are we ready to enter upon it?

The present legal powers of the Interstate Commerce Commission are tolerably well settled. The question whether, when it finds a rate too high, it must appeal to the courts one time or a dozen times, in order to enforce the necessary reduction, is yet to be answered, but that will probably be done before long, and in any event this does not affect the main point, which is that the courts must always be the final arbiters of these questions. Whatever the "interests of commerce demand" it is not likely that Congress will go beyond the Minnesota Supreme Court decision, that the courts must always have their ancient braking-power on extreme legislation. For Congress to confer absolute rate-making power upon five men would be monstrous; such a power would not be conferred, by a legislative body of reasonable men, even upon the Supreme Court, except

under the well-known checks and safeguards that surround the presentation of questions to that tribunal; and it would be hardly less outrageous for Congress to pass rigid and specific laws in the same line itself. The business of the railroads of a country covering 3,000,000 square miles is more diversified than any one can comprehend, and to think of settling all the rate questions, or a hundredth of them, in Washington, would be as absurd as to try to have all lawsuits tried *de novo* by the Supreme Court. It could hardly do more harm to empower the Weather Bureau to prescribe the temperature every night for the fields of the millions of farmers to whom it sends bulletins.

Master Car Builders' Convention.

The thirtieth annual convention of the Master Car Builders' Association, which will be held at Saratoga next week, will, we suppose, have the characteristics of the conventions of the last two or three years: that is, a number of important reports will be presented and a good deal of very useful business will be done, but there are no revolutionary matters in sight. The great fights seem to be over and the Association is now in the stage of developing and perfecting railroad practice. It has passed out of the era of warfare into that of civilized peace.

Of the reports to be presented, the one which stands first in order in the published list of subjects, and the one which we should suppose might be the most important, is that of the Committee on Laboratory Tests of Metal for Brake Shoes. It was supposed last year that this would be the final report of the Committee and that it would b made in association with the Committee on Road Tests. The investigations of this Committee seem certain to be of great use in their ultimate results, and the subject is the most complicated and difficult one taken up by any of this year's committees. It has been a great labor to collect data and it will require much ability and care to generalize usefully from the data collected.

The task before these committees is to ascertain not only what metal is cheapest in the long run, but what is most efficient, and as it is unlikely that the cheapest metal will be the most efficient the committee has the delicate task of deciding just what weight to give to these two elements in the selection of the most useful brake-shoe metal. The case is really one of high scientific experimentation. Few matters so complex have ever been taken up by the M. C. B. committees. In the 1895 report the Committee on Road Tests ascertained relative cost of a number of different kinds of brake shoes subject to the same service; but the committee said the "actual relative economic value of different kinds of brake shoes can be determined only by combining the ratios with corresponding ratios which would express the relative amount of friction." These latter ratios were what the Laboratory Committee had to determine.

Everybody knows now that the relative efficiency of the brakes depends, other things being equal, upon the relative friction between the shoe and the wheel. It becomes extremely important, therefore, in mixed service, to find a brake-shoe metal which will be acceptable to all the roads for their freight cars, or, at any rate, to most of them. This is a necessary step toward economy, for want of uniformity in the brake shoes in any given train is a fruitful source of slid wheels.

Perhaps the report next in importance will be that on the Axle and Axle Fittings for 80,000-lb. Cars. In a series of articles which we published last April and May we undertook a careful analysis of the stresses in car axles, and to arrive at some conclusions as to the proper form, dimensions and material for axles. We started out with the proposition that calculations as to the strength of axles were very uncertain and that a large factor of safety was necessary, and we said "the fallacy of the common calculation of the strength of car axles is brought out in what follows, not for the purpose of showing what the limits of axle stress really are, but to show how little we really know about it all, and how much safer it is to be guided by the practical results that have been obtained from the millions of axles that have been put in service." This was not intended as a discouragement of scientific theoretical research, but as a short statement of the great difficulty of arriving at theoretically correct proportions and dimensions. Indeed there were scoffers who said that the whole matter was of slight importance inasmuch as axles do not break; but it was not difficult to show enough broken axles to put scoffers on the defensive.

Some of the conclusions that we arrived at were: That the load required to strain the outer fibers to the elastic limit is about 30 or 40 per cent. greater than common calculation gives, and hence the real factor of safety is greater than the apparent safety. That the stresses are not excessive for a quiet load, but that, as the load oscillates, the stresses are often at least double those due to a quiet load and therefore greater than is safe for long-continued service; furthermore, the wear of the journal increases the fibre stresses. That the M. C. B. standard axles should be made larger in dimensions, but the general form should be retained; that is, the axle smaller in the middle than at the wheel seat. That a journal 4¼ in. in diameter is none too large for 40,000-lb. cars. That breakages from initial cracks are almost never found except at the neck of the journal and that the journal should be large and have a large fillet at the inner end. That the spring should have considerable motion remaining after the load is applied to avoid the shock due to the closing of the springs. Naturally, we shall look with a good deal of interest at what the able committee on the axle has to say on this important subject.

Another report of decided importance and interest should be that on Metal Underframing for Freight Cars. We do not anticipate any sudden revolution in the substitution of metal for wooden frames, but unquestionably there is a decided movement in that direction, and it can hardly be doubted that before a great many years the general practice will be to build the underframe of freight cars of metal, and it is none too soon for the Master Car Builders' Association to study this subject systematically with a view to promoting not only economy and efficiency, but uniformity of design, for after all the point of greatest practical importance is to make the frames of standard commercial shapes and sizes. Indeed we may go so far as to say that this is the only practicable way of designing metal car frames. The cost and difficulty of repairing cars built of special shapes must—in a country like ours where the freight cars travel over half a continent, and must be repaired in all sorts of places—always minimize, if not preclude, special shapes. A number of designs have been brought out in the last year or two, and we understand that there will be several metal cars shown at Saratoga. We note with considerable interest that our old acquaintance, the tubular underframe, has not appeared for a long time in the discussions of this subject. But we should not expect a conclusive report from this committee. The design of a metal car frame is a pretty important piece of engineering work, and the final design must be the result not only of a good deal of special study, but a good deal of actual experience with metal structures.

Another report of importance will doubtless be that on Mounting Wheels, and we are prepared to see a report so thoroughly studied and worked out that it can be taken as final and this complicated subject closed.

A report on one of the minor subjects is that on the Location of Air-Brake Cylinders on Freight Cars. Obviously, practical uniformity in the position, not only of the cylinders but of all the parts, is desirable to facilitate inspection. But another point, perhaps still more important, is that of so placing the cylinders that they can be easily cleaned. This was brought out very distinctly in a report presented at the last meeting of the Air-Brake Men's Association. That committee said that the location of cylinders and adjacent parts has great influence on the cost of cleaning and lubrication. Sometimes cylinders are placed so near the needle beam that it is difficult to remove the head. The most inconvenient placing is generally found on hopper cars and other special equipment. The committee mentioned certain cars on one Chicago road on which the cylinder heads project into the needle beams and the cylinder must be taken down to be cleaned. The cost of cleaning and oiling one of the cylinders is from 36 to 51 cents more than it would be if the cylinders were accessible. One coal road has many hopper cars on which the cylinder is so placed that the head projects into an opening in a casting which forms a combined queen post and hopper bracket. This cylinder also must be taken down to be cleaned. Where the cylinder head is close to the needle beam (and it is sometimes less than a quarter of an inch from it) the cost of cleaning will be much above the average; in fact that committee found some cases in which cylinders could not be taken down without cutting away wood work. We may assume that the M. C. B. Committee will call the attention of the association to these faults of design.

Other reports are on Automatic Couplers—size of shank, and attachments; Passenger Car Ends and Platforms, Freight Car Doors and Attachments; Handholds and Height of Drawbars, and Uncoupling Arrangements for M. C. B. Couplers. Certainly there is no lack of material for work, and presumably there will be all the usual provisions for enjoyment, and we wish the Association a prosperous and profitable convention.

The A. R. A. Block Signal Rules.

The action of the American Railway Association on the rules for operating the block system (reported May 29) is disappointing. It was highly desirable that there should be thorough discussion of details, for the committee that reported these rules has left many points untouched on account of the impossibility of reaching an agreement concerning them, and some of the points on which it has agreed are pretty sure to be subject to criticism if the code is taken up by any road with a view of adopting it.

Measured only by the narrow rule that the sole function of the Association in a matter of this kind is to formulate principles or rules recognizing the present practice of the majority of the members of the Association, with careful avoidance of everything not approved by the majority of roads, no matter how meritorious, the code may be all right: but we doubt whether, even on that supposition, it will be of material aid in promoting good practice. The roads which already have carefully prepared rules for Sykes instruments, the New York Central, the Erie, and the New York, New Haven & Hartford, and those which have equally simple and satisfactory regulations for non-controlled signaling, such as the Pennsylvania and the Chicago, Burlington & Quincy, will find too little that is better than what they have now, and too much that is not so good, to be strongly inclined to adopt the work of the committee.

The standard code of train rules, adopted in 1887, effected two important reforms—one in the language of train rules and the other in the practice under those rules. The latter was not so widespread as the former, but it was nevertheless a valuable result of the establishment of the code. The signal practice which this code of 1896 deals with was not in such great need of reformation, and the language of the rules had not been jumbled and distorted by the efforts of a thousand superintendents, working independently of each other, for 45 years. There is practically very little disagreement as to principles of practice under each of the three different methods of operating the block system and the need for clarification of language is mostly in those rules which this committee found itself unable to make any recommendation upon. For these reasons the signal code does not seem likely to become at once popular as did its predecessor.

Practice being so well settled that no code can effect much change in it, the new code is to be judged mainly by its language and arrangement. The most useful thing it can do will be to simplify and unify the wording of signal rules. For an example of the theories on which it is constructed, take rule 502, the substance of which is as follows:

SIGNALS.

Signal.	Occasion for Use.	Indication.	Name.
Color.	The signal will be displayed when	For enginemen and trainmen.	As used in rules
(*a*) Red.	Block is not clear.	Stop.	Stop signal.
(*b*) —.	Block is clear.	Proceed.	Clear signal.
(*c*) —.	Block is not clear.	Proceed with caution.	Caution signal.

Where the semaphore is used, the governing arm is displayed to the right of the signal mast as seen from an approaching train, and the indications are given by positions:
Horizontal as the equivalent of (*a*).
Vertical or Diagonal —* as the equivalent of (*b*).
Diagonal —* as the equivalent of (*c*).
*Angle above or below the horizontal.

It seems to us that the spirit of the most advanced opinion in signal matters, as evinced in all the public discussions of recent years, condemns the ground principle, here adopted, of giving the colors (red, white and green) the primary place, and treating the semaphore as an after-thought. "Horizontal is equivalent to red." Why not say that horizontal means "stop"? To say that it means red and that red means stop is a roundabout phrase justified only by undue reverence for ancient customs which are now dying out. For years everybody has been extolling the semaphore as the ideal signal and yet we find it here playing second fiddle to a red disk.

What reader, not having followed the discussion, would guess, without considerable study, what is meant by the explanations of the vertical and diagonal indications? These lines become at once plain, however, when it is understood that the rule is intended to cover two very diverse practices; that of the Erie (in Ohio) where caution is indicated by inclining the arm upward, and that of the Pennsylvania lines west of Pittsburgh, where the arm *down* at 45° means caution, and the same down to 90°, or nearly so, means clear. A fundamental principle in rule making is, or should be, to make the language as clear as possible, and it requires only a glance at the individual codes under which these differing plans are now worked to see that the rules can be made much clearer by not trying to describe two almost opposite functions in the same breath.

The foregoing instance is mentioned merely as an

illustration of numerous cases in which directness of language is sacrificed for the purpose of making a rule sufficiently general and inexplicit to cover two or more different acts. This generalizing process cannot be successfully carried out without running into vagueness, which becomes weakness. And the language is not the only questionable feature, for some of the rules which seem to be intended for use on either double or single track are suitable only for double. The seventh requisite under "controlled manual" is almost meaningless except where the length of trains is limited. The difference between the "controlled manual" and the "telegraph" block system is an arbitrary one and some of the things prescribed only for one are equally applicable to both. The line separating the one from the other is irregular and indefinite at best and an attempt to make it appear clear and distinct runs the risk of doing as much harm as good.

But possibly the action of the Association in approving a bell code for lock-and-block instruments, hus promoting uniform practice in that feature of block signaling, will do enough good to more than balance anything that is wrong or imperfect, and make it seem ungracious to pick flaws. A uniform bell code certainly was needed. We do not know how satisfactory this one will be, for the officers of the two principal roads whose codes have been made the basis of this one are not, we believe, fully satisfied with their present practice. But bell signals are likely to be used much more than they are now used, and it will be a great advantage to have all roads start right. It seems likely that on parts of many roads manual blocking will be as economical as the automatic track-circuit, and if manual blocking is continued, the desirability of having separate apparatus for each track, as in the Sykes system, must come to be more and more recognized. We know from English experience that separate bell instruments are available without going to the expense of putting in the elaborate apparatus that is necessary with the Sykes system, and the increasing use and cheapness of the telephone indicates that the Morse telegraph may not always be so generally and exclusively favored as it now is. This combination of conditions, cheap bell signal apparatus and cheap telephones, will afford two advantages; it will not be necessary to have a Morse telegraph operator at every tower, and the two functions, signaling and talking, can be kept entirely distinct. Separating the signaling from the business of sending messages and conversation will be in the line of safety, and the disuse of the Morse instruments will greatly promote the convenience of the superintendent, whether it effects any saving in salaries or not.

Some Suburban Time Tables.

The present time table of the Providence Division of the New York, New Haven & Hartford (Boston to Providence) shows the local short-distance passenger trains to and from Boston arranged at regular intervals in a way evidently the result of much care, and which in some respects is an improvement over the plan in use at the New York end of the road. From Boston the suburban trains running out on the main line go as far as Readville, nine miles. Most of these trains omit the first five stops, as these stations are served by other trains which run to Forest Hills, the sixth way station, and thence proceed on a branch to Dedham, 10 miles from Boston. Thus there are two series of trains and those of each one, throughout the day, are timed at intervals of either one hour, half an hour or 15 minutes, without exception. No attempt is made to have them leave Boston on the even hours and half hours, and of course this could not be done at the way stations, which average less than one mile apart; but, the time once learned by a passenger for a few of the trains, he can readily carry all the rest in his head, bearing in mind that the longest intervals are in the middle of the day and the shortest during the busiest hours. We append a few sample schedules:

	p. m.	p. m.	p. m.	p. m.	p. m.	p. m.
Boston	4.17	4.47	5.17	5.47	6.02	6.17
Forest Hills	4.28	4.58	5.28	5.58	6.13	6.28
Dedham	4.46	5.16	5.46	6.16	6.31	6.46

	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.
Boston	7.19	8.19	9.19	4.19	4.49	5.19
Forest Hills	7.30	8.30	9.30	4.30	5.00	5.30
Readville	7.43	8.44	9.43	4.43	5.13	5.43

The New York plan, established seven or eight years ago, attempts to have all trains start out on the even hour or half hour. It was based on the theory that, with the very short block sections existing for the first few miles out of New York, three or four trains could be started at about the same minute; but this was found to be troublesome in practice, and the intervals were lengthened so that, for instance, at 4 p. m. the fourth train which, theoretically, ought to start at about 4:01 or 4:02 leaves at 4:08; while at 1 p. m. or 9 a. m., the last train of the group starts at two minutes past the hour. Thus the passenger who tries to keep the trains in his mind by remembering the even hours may waste six or eight minutes of his time in the case of the largest group. The trains for New Rochelle, for instance, leave New York at 3:06, 4:08, 4:33, 5:05, 5:33, 6:06, 6:30. If the time were uniformly eight minutes past the hour or half hour it would be easier to remember. This would not be free from difficulty, however, without a radical change in the plan, for in some cases two trains would have to be advertised to start at the same moment, whether they actually did so or not. Thus the 4:08 train is run practically as a second section of the 4:05, but for a part only of its journey, and if all the hours were easy for New Rochelle they would be irregular for stations farther from New York, where the total number of trains is less. If the constant trains were all timed at 3:08, 4:08, 5:08, 6:08, etc., and the second sections were put in at 4:23, 5:38, 5:53, etc., the passengers to the more distant stations would lose the advantage now enjoyed of running past the first half-dozen stations without stopping, for *all* of the trains would then have to stop at all stations, as far as they went, in order to make the change of any advantage. The present scheme is made on the assumption that passengers prefer the best possible speed, even at a small sacrifice of regularity of intervals.

Even the Boston scheme is subject to modification—that is, the passenger has to tax his memory with additional times—where "express" trains are put in between the regular hours to relieve the accommodations; and at Forest Hills, where both groups of locals and some expresses, in addition, always stop, the regularity of interval is destroyed. In the present case this is not very objectionable, because the longest intervals are quite short.

Probably neither of the authors of these different schemes would admit sufficient merit in that of the other to lead him to make a change. The only criticism we have to suggest is that times should not be changed to suit little irregularities that have to be dealt with by the enginemen. Where all the times end with 45 or 15 for a long time, it seems hardly worth while to make one 46 or 17 just because it is difficult to make time with that particular train over one short section of road. Why not let the schedule stand, even if the train has to start a little late? One irregularity like that destroys one's confidence in his memory, perhaps, for the whole table.

Annual Reports.

Chicago, Rock Island & Pacific.—The annual report of the Rock Island is for the year ending March 31, 1896. the total miles operated were 3,571, which includes 253 miles of leased and 338 miles of trackage rights. The main results of operation are as below:

Gross earnings:	1896.	1895.	Inc or Dec. Per cent.
Passenger	$4,445,952.85	$4,338,052.97	I. 2 49
Freight	11,159,100.26	11,206,685.70	D. 0 42
Mail	540,259 86	499,248 20	....
Express	409,200.00	400,875.00	....
Rent, interest, etc	797,266.08	967,6 1.29	....
Telegraph lines	7.874.27	8,302.85	....
Total	$17,359,653.32	$17,420,816 61	D. 0.35
Oper. exp	10,977,321.13	11,845,367.92	D. 7.33
Taxes	889,272.92	836,893.29	....
Net earnings	$5,493,059.27	$4,738,555.40	I. 15.9
Percentage exp. to earn.	63 33/100	68	
Same, including taxes	68 38/100	72 80/100	

The number of passengers carried increased 11.28 per cent., the total being 5,131,406. The total passenger movement was 204,045,426 miles, the increase having been 5.64 per cent. The average rate was 2.089 cents, and the year before it was 2.15. The freight earnings decreased slightly; that is, 0.42 per cent. The ton-mileage, however, increased 0.66 per cent., to 1,078,846,776 ton-miles. The ton-mile rate fell from 1.05 cents to 1.03.

It will be observed that, notwithstanding a decrease of 0.35 per cent. in the gross earnings, there was an increase of 15.9 per cent. in the net, the working expenses having decreased 7.33 per cent. This reduction was apparently largely due to the diminished train mileage. The engine miles fell from 18,461,128 in the year ending March 31, 1895, to 16,789,017 in the year under review. The average freight train-load in the last year was 143 tons, and in the year before it was 121. The maintenance expenses were not materially changed from the previous year, being in the aggregate about $200,000 more, but they were $870,000 less than in 1894. Out of the net income the interest payment amounted to $3,322,525, and the dividend at two per cent. amounted to $923,116. The surplus for the year was $500,592.

Five large locomotives and 426 box and coal cars were purchased or built during the year, to take the place of old and worn-out equipment, the entire cost being charged to operating expenses. The company's proportion of the amount expended on the Chicago track elevation during the year was $208,289.90, making a total expenditure to date of $347,856.93, covering a distance of 2½ miles.

Southern Pacific.—The results of the operation of the company's lines in 1895 make a good showing, in some respects better than in the previous year, and 1894 was not an unfavorable year, in spite of a good many disadvantageous conditions. In 1895 gross earnings were over fifty million dollars, an increase of $1,485,618, or 3.03 per cent. Operating expenses, however, also increased, so that we have only a slight increase in net earnings, about $250,000. The final results make better comparisons. The net income from operations was nearly $3,000,009, and $440,000 more than was reported in 1895. These figures are for what are called the proprietary and leased lines, operating 7,345 miles of road. The other lines of the company, operated independently, control 622 miles, and the steamship lines of the company operate 3,251 miles of water lines. The earnings of all these are reported separately. The general results of leased and proprietary lines are shown in the following table:

	1895.	Inc. or dec.
Gross earn	$50,457,025	I. $1,485,618
Oper. exp	33,242,436	I. 1,235,522
Net earn	$17,214,589	I. $250 097
Total receipts	19,591,474	I. 710,356
Interest, rentals, taxes, etc	17,406,252	I. 518,991
Surplus	$2,185,222	I. $191,365

If we add the $790,000 advanced to the Oregon & California to meet the deficit in its operations, the net income from operations for the year was $2,976,034, or $440,822 more than reported in 1894. Summarizing results further, we find that the earnings of the proprietary companies, over operating expenses and fixed charges was $2,579,108; add other income of Southern Pacific Co., $616,783, and deduct the loss in the operation of leased lines, and the surplus after the payment of fixed charges was $2,976,034. The capital charges for betterments and additions were $1,777,048, and the balance remains as $1,198,986. This sum is exclusive of $372,886 charged to sinking fund, and all other charges. It compares with a surplus of $1,213,963 in 1894.

The freight earnings were $31,408,620, an increase of $1,240,440. Passenger earnings, not including mail, express and baggage receipts, were $12,023,177, only about $13,000 more than in 1894, but in that year the Company received a heavy traffic from the Mid-Winter Fair—passenger earnings in that year having been $367,000 larger than in 1893. The earnings from steamship lines were $2,691,490, or $56,581 less than in 1894 and over $300,000 less than two years ago.

The freight business of the year presents no features of special interest. The decrease in wheat exports from San Francisco, which materially affected the companys' earnings in 1894, was more than made up, the exports in 1895 being 552,580 tons. In 1894 the exports were only 360,041 tons, and in 1893 about 543,000 tons, though the value of the wheat exported in that year was over $2,300,000 greater than in 1895. The Atlantic system shows a larger freight traffic than ever before, although the Texas cotton crop last year was but 62 per cent. of that of the preceding year. The tons carried and ton-miles have increased largely but the rates obtained have fallen off.

The tonnage moved over the lines of the Pacific system and Atlantic properties averaged 362,403 ton miles per mile of road operated, and exceeded by 9.18 per cent. the tonnage of 1894. President Huntington remarks that the decrease in rates operated to diminish the freight earnings by $1,064,454.58 from the amount the company would have received had the rates obtained in 1895 been the same as those obtained in 1894.

Liberal expenditures were made in improvements during the year. The cost of maintenance of way and structures was $5,120,000, or $1,029 per mile of road on the Pacific system, corresponding figures in 1894 being $4,664,000 and $945. On the Atlantic system similar expenses increased $61,000 in the aggregate and decreased $15 per mile of road. The charges for maintenance of equipment on the Pacific system increased $557,000, or over 19 per cent. On the Atlantic system the charges varied only $11,000 in the two years.

The Railroads of the Cape of Good Hope.—The colonial railroads of the Cape of Good Hope now have a total development of 2,349½ miles. They reach the sea at Cape Town in the southwest and at Port Elizabeth, Port Alfred and East London in the southeast. The Western System extends from Cape Town north by east through Cape Colony, past Kimberley and across the Vaal River, into Bechuanaland, ending at Mafeking. The Midland, Eastern and Northern systems run inland northwesterly from the three ports on the southeast side of the Cape and then northeasterly across the Orange Free State to the Vaal River, beyond which the railroad goes by the Netherlands Company's system into the South African Republic, reaching Pretoria, Johannesburg and Springs.

The report of the General Manager, Mr. C. B. Elliott, for the year 1895, is issued under date of March 20 and has just reached us. He says that the financial results of the year were not only "eminently satisfactory, but phenomenal." After deducting the shares due to the Netherlands Railroad Company and to the Orange Free State, the net earnings on an interest-bearing capital of over £20,000,000 sterling amount to no less than £7 9s. 10d. in the hundred. The revenue account for the two years is as below:

	1895.	1894.
Earnings, passengers	£906,646	£877,378
" freight	2,327,430	1,902,941
Mails and miscellaneous	136,222	133,134
Hire of rolling stock by Orange Free State	19,794	.....
Total	£3,390,092	£2,713,753
Working expenses	1,596,013	1,483,771
Net earnings	£1,794,079	£1,229,982
Per cent of expenses to earnings	47.1	54.7

It will be observed that passenger earnings increased 34 per cent., freight 22 per cent., working expenses, 7.5 per cent., and net earnings 46 per cent. The train miles in 1895 were 8,135,550, being an increase of 1,042,751, or 15 per cent., which increase was due mainly to the great increase in traffic. The gross earnings per train mile were 10s. 3.5d. in 1895 and 7s. 7.8d. in 1894. The net earnings were 6s. 8.6d. and 3s. 5.6d. in 1895 and 1894 respectively. Reducing these figures at 25 cents to the shilling, the gross earnings were $2.57 per train mile in 1895 and $1.91 in 1894. The net were $1.50 and $0.86. In the United States, in 1894, by the Interstate Commerce figures, the earnings per train mile were $1.37 gross and $0.43 net.

No statement is made of the reasons for the increase of

business, but we may suppose that a great deal of it was due to the very rapid development of the gold-mining industry. This is evident from an analysis of the earnings of the different systems. The Western System is the line extending from Cape Town into Bechuanaland, which has naturally been least affected by the recent development of gold mining. The Midland System and the Eastern System run from the eastern ports to a connection with the Northern System, which latter crosses the Orange Free State, and then by the Netherlands Company's System serves the South African Republic. The earnings per mile of road of the Western System increased in the year 15 per cent.; those of the Midland and Eastern systems increased 21 per cent., while the earnings of the Northern System increased 31 per cent., from which it is sufficiently evident that the most important factor in the growth of the year's earnings was the activity in the Transvaal.

We find no statements of average rates, or traffic statistics which would enable us to estimate the rates; but the General Manager says that it can hardly be expected that the public will be satisfied if the abnormally high rate of 7½ per cent. on the large capital expended is continued to be earned. He thinks therefore that this is a suitable time for lowering some of the rates, and this has already been decided upon by the government. From the 15th of April considerable reductions were to be made in rates charged on South African produce, especially with a view to encouraging long-distance traffic. The short-distance rates are considered too low already.

The General Manager warns the government against ill considered extensions of the railroad system. He says there is great danger of rushing into large expenditure when the net earnings have been brought up to such a phenomenal rate, and he advises extreme caution in lowering rates and in beginning what are sure to be unprofitable lines.

The sudden development of traffic, principally between the ports and Johannesburg, caused an immense strain on the resources of the Department, and looking back on the last half year he is surprised to think how well the Department was able to handle this unexpected increase. It takes about nine months to order and procure new engines Fifty-six new engines were ordered from England, and many of them have been received, and about 1,500 trucks have been ordered and have begun to arrive.

From the report of the Chief Engineer, Mr. Brown, we learn that the relaying of the main lines with 60-lb. rails was completed during the year. Of crossties it appears that 58,723 wooden ties were laid in the year and 2,749 metal ties. Several of the metal crossties which have been removed from track are found badly worn under the seat of the rail and in some cases the end of the tie is broken off. "From a general inspection of this class of sleeper a considerable wear is apparent and it is probable that the life of these sleepers will be considerably less than was at first expected."

The Superintendent of the Locomotive Department, Mr. Stevens, says that the number of heavy-rail, main-line engines now in use is 210. Of these 24 have four wheels coupled, 120 are are six-coupled and 66 have eight wheels coupled. The use of the four-coupled engines is confined to local service and to one section of comparatively low traffic. Only three types of heavy rail engines are generally used on the main line. These are six-coupled engines for passenger trains and for mixed trains and trains carrying perishable freight over lines with grades of 1 in 40 and curves of from 5 to 8 chains radius, also for freight and mixed trains on the easy grade sections. Another type, having six wheels coupled, is used for working trains of all kinds including fast passenger service, on the sections having grades of 1 in 80 and of curves of not less than 8 chains radius. The third type, with eight wheels coupled, is suitable for working the heavy freight traffic on 1 in 40 grades and on parts of the 1 in 80 grade sections, irrespective of curvature. Aside from these, there are 11 tank engines and two American engines, making the total number of heavy-rail engines 223 Mr. Stevens says "the two American engines, which have done fairly good service, are now regarded with more favor than at first, but the type of construction is one for future, rather than for present, adoption, as the limit of weight imposed by the expert who examined the bridges in 1892 has been reached with the English type of construction."

We get some interesting information about lubricating oil. Mr. Stevens says that an attempt was made on a large scale during the year to substitute mineral oil for castor oil for lubricating the rolling stock On Coast sections the mineral oil answers, but on frosty nights up country it thickens and has caused many hot boxes in the winter months, and therefore its use had to be abandoned. Samples suitable for winter use have been ordered for further trials, but excellent castor oil can be imported from India at a price so low that there is not much chance for saving.

Not every railroad superintendent will approve the plan of letting enginemen hire and discharge their firemen without consulting any officer of the road, and the account of the scheme now in force on the Minneapolis, St Paul & Sault Ste. Marie, published in the *Railroad Gazette* of May 22, has aroused considerable interest. A reporter of the St. Louis *Republic* evidently has found a railroad officer who does not like it. He says:

What if the railroad does not recognize the firemen as employees? The court does. Even if the engineers do hire the firemen, the railroad is responsible for them to the law. How, under such a system, is a railroad to know what class of men the engineers are securing as firemen, their antecedents, and judge as to whether or not their addition to the service is desirable? [The rules provide for this, more or less completely.] Grant that the system could be put into effect on a majority of the roads in the country, where would those roads be in the event the engineers concluded to quit operations on account of some grievance, and take their servants with them? Again, would the same character of intelligence and habits of self-reliance and judgment be found under a system like this? As it is now, any fireman employed on the larger railroads knows that if he attends to his business, studies machinery and the rules governing the movement of trains, it is only a question of time until he is promoted, and that, too, without having to go to some engineer's house and chop wood, carry coal or clean up the backyard to "stand in" and keep from being discharged.

In answer to the *Republic's* third question it might be suggested that possibly the "servants" might not quit work just because their masters did. They might conclude to apply for the masters' places.

NEW PUBLICATIONS.

A Manual of the Principal Instruments Used in American Engineering and Surveying, Manufactured by W. & L. E. Gurley; 31st edition. Troy, N Y. W. & L. E. Gurley, 1895. Price, 50 cents.

This edition, the 31st of Gurley's Manual, is issued as a semi-centennial edition. Fifty years ago the manufacture of instruments was begun in Troy by Mr. Jonas H. Phelps and Mr. Wm. Gurley. The house then established continues under the name of W. & L. E. Gurley. The little volume of 438 dudecimo pages contains a general descriptive price list first; then follows a chapter of information to purchasers on selection and trial of instruments, etc. An important part of the book, namely, 232 pages, is taken up with detailed descriptions of various instruments with directions for making adjustments. Every engineer, and every student who has gone far, will appreciate at once the usefulness of such a book, and especially when it has been prepared by people of such experience as the Gurleys. A supplement, which is really one of the important parts of the book, being 141 pages, is a descriptive price list of drawing instruments and draughtsmen's material of all sorts.

Proceedings of the Third Annual Convention of the Association of Railroad Air-Brake Men. P. M. Kilroy, Secretary, Pine Bluff, Ark.

The third annual convention of the Air-Brake Men's Association was held in Boston less than two months ago and the report of the proceedings now appears with praiseworthy promptness and well printed. Not the least attractive feature of it is the fact that it is embellished with the portraits of the nine handsome young men who serve the Association as officers and members of the Executive Committee. The volume contains in full the reports (some of them very valuable), of which we printed abstracts at the time, also the discussions, the list of subjects and committees for the next meeting and a list of members. The next convention will be held at Nashville, Tenn., beginning April 13, 1897.

TRADE CATALOGUES.

Cranes, Steam Shovels and Pile Drivers.—The Industrial Works, Bay City, Mich., are issuing a series of handsome monthly circulars showing the wrecking cranes, locomotive cranes, steam shovels and steam pile drivers and other contractors' material manufactured by them. The circulars are well illustrated by half-tone engravings and have short general descriptions of the various apparatus.

Emergencies in Railroad Work.

(*Continued from page* 413.)

a more convenient season or the all-accommodating Sunday. Meantime much has been done in other directions. The party calling for assistance is required to supplement his call with a description in some detail of the situation and an estimate of the probable time required to clear. If this be more than four hours no more freights are despatched from terminals, but effort is concentrated upon marshaling trains and clearing up the yard tracks to take care of the concentrated movement which must follow the resumption of business. If the estimate is for less than four hours the trains are moved up as close as possible to the wreck and so put away on the sidings that when the movement is resumed the knot will easily untie.

Unusual delays in starting wreck trains.

1890—37 mins.(night) waiting for wreckmen.	43 mins. (day) loading extra trucks.
1891—54 mins.(night) waiting for sectionmen.	
1892—30 mins.(night) waiting for wreckmen.	28 mins. (day) no steam in boiler to blow alarm whistle. Had to send caller for men.
1893—57 mins. (night) Bellaire wreck train waiting for crew.	23 mins. (day) turning derrick car.
1894—37 mins. (night) alarm out of order.	32 mins. (day) turning derrick car.

Washouts.—I had been but a short time in the service of the Pennsylvania Railroad when, on March 9, 1878, the double-track wooden bridge by which their New York division crossed the Raritan River was totally destroyed by fire. The bridge was about to be replaced in iron, indeed the shore span, a draw over the Delaware and Raritan Canal, had been erected on false works, and was to have been swung in place on the following day. Fortunately it was not damaged, eliminating what might have been the most serious obstacle in reconstruction. In view of the contemplated erection of the new bridge, the duplicated wooden structure that had for so many years been carried in stock for just such an emergency, had been dispersed and used up. Nevertheless, by March 15, traffic was resumed. During the interval the debris had been cleared away, the draw span fixed in position, and there had been erected a single track, wooden trestle 1,050 ft. long and 48 ft. high, with two story bents. . . .

On the night of May 12, 1886, "the great storm" raged over the Miami valleys in the state of Ohio. It began about 8 p. m. and was over by 10 p. m., but during that time it is estimated that 5 in. of water fell in the district about the cities of Dayton and Xenia. For hours after the storm the destruction caused by the rushing waters continued, and it was not until nine o'clock of the following morning that it finally ceased. Then it was found that on the Little Miami division of the Pennsylvania lines 26 iron bridges, two trestle bridges, three stone arch and two box culverts, and over seven miles of track had been destroyed, for besides that carried off with the bridges there were 32 breaks varying from 100 ft. to 6,000 ft., where the track was washed off the roadbed, the roadbed cut out from under the track, or both carried off together. . . .

The work of reconstruction was begun at 4:30 a. m. of tthe 13th when a work train was dispatched from the Pendleton shop with 75 men and several carloads of timber. As rapidly as possible the carpenter forces of the entire Southwest system, together with large details from the principal repair shops, were concentrated on this division, and the repairs pushed day and night. Each gang brought with them carloads of timber and the tool car in which they carry the working outfit for use in their regular work. The main line was opened at five o'clock of the afternoon of Saturday (the 15th). On the Dayton & Western branch where the damage had been most severe, the work was completed on Wednesday night (the 19th) about eight o'clock, when all lines were again open and full schedule resumed. . . .

The work suffered seriously from the necessity of quartering the men in the neighboring farm houses and barns, and from the long interruptions in going to and from meals, even when train service could be partially utilized for transport.

In June, 1891, a committee of the American Society of Civil Engineers reported "on the cause of the failure of the South Fork Dam. . . ."

"The rise of the water during the flood was generally about 30 ft. at some points, however, it was considerably more, at Bridge 6, for example, it was nearly 50 ft. The flood washed away nearly all the bridges between South Fork station and Johnstown, except the stone skew arch bridge near the Cambria Iron Works, and nearly all the embankments and a great part of the tracks." The roundhouse at Conemaugh was destroyed and the locomotives in the same washed down the stream, one, a heavy freight engine, to a distance of 3,300 ft.

The dam broke at 3 p. m. of Friday, May 31. On that day I had been making an inspection trip of our Tuscarawas branch when I received orders to proceed at once to headquarters, load all the available bridge material, fit up a camp train and provision the same, muster the division's force of carpenters and hold them in readiness for further instructions. Before midnight of Friday the detail of the Pittsburgh division of the Pan Handle was set to work and by night had made such repairs of the track from Sang Hollow to the bridge at Johnstown as made possible the operation of a single line. By this time the extent of the calamity began to be realized and the line was given up to the transport of relief committees, supplies of provisions, and coffins, succor for the living and housing for the dead It was not until five o'clock of the morning of June 3, when Mr. J. F. Miller arrived on the ground and assumed personal charge, that the work of further repairs began. Even then the forces had to be marshalled slowly, for there was but little room at the front for those at work, and the lines of communication were badly hampered with the work of relief. The supplies for the Red Cross society and relief committees always had precedence over everything. Much had been done, however, in providing material; large quantities of track material had been purchased and loaded at Pittsburgh, timber was being forwarded from Cincinnati and Cleveland, and the large mills of the Alex McClure Company at Pittsburgh were running night and day in its production.

Profiting by the experience of 1886 each detail of men brought with them a train provided with commissary and sleeping accommodations. When later the men from the repair shops were added, a camp was established and these men lodged in tents. On Monday I was ordered to the Bow Bridge over the Conemaugh on the West Penn division. At this point the river makes one of its characteristic sweeps, and the railroad avoids a detour of three miles by crossing a river twice and

WRECK TRAIN SERVICE, C. & P. DIVISION, PENNSYLVANIA CO.

Year.	No. of times called.		Total time between call and start.		Average time between call and start.		Time running to wreck.		Time clearing wreck.	
	6. a. m. to 6. p m.	6 p. m. to 6 a. m.	6 a. m. to 6 p. m.	6 p. m. to 6 a. m.	6 a. m. to 6 p. m	6 p. m. to 6 a. m.	Total.	Average.	Total.	Average.
			min.	min.	min.	min.	min.	min.	min.	min.
1890	20	20	390	713	19	36	1,783	45	6,136	153
1891	52	30	585	613	11	20	2,250	27	9,227	112
1892	44	26	678	473	15	18	2,682	38	7,393	106
1893	37	15	517	319	14	21	1,693	33	4,665	90
1894	14	19	230	527	16	28	1,469	45	6,087	185
Total	167	110	2,400	2 645			9,877		33,508	
Average	33	22			15	24		36		2h. 2m.

Meantime, arrangements are making for detouring mail trains over foreign lines and around the obstruction, or for transferring by the same from train to train. Altogether there is a fine activity which is but feebly set out in records from which I have compiled the following tables:

Minimum time between call and start.

Year.	6 a. m. to 6 p. m.	6 p. m. to 6 a m
1890	5 mins.	13 mins.
1891	2 "	8 "
1892	3 "	8 "
1893	5 "	5 "
1894	5 "	13 "

tunneling the dividing ridge. The upper of the two bridges a three span deck Howe truss, built on a three degree curve, from which latter fact it came by its name, had been washed away. Arriving at 4:30 p. m. we found room to stand one car between the portal of the tunnel and the edge of the bank, from which the bridge's abutment had been torn. The timber after being unloaded and cut to proper lengths had to be slid down and framed into bents on the slop of the bank; whence the bents were launched into the stream, steadied by guide lines, floated to position, and raised to place with balance beams, the fall lines leading back to the train, the engine of which was well back in the tunnel. Signals were passed by lanterns. With the water 7 ft. deep in the stream, running like a mill race and still carrying much floating wreckage, the bottom covered with stones from the fallen abutment and piers, the work with our light force was very severe. We worked without interruption except for meals, of which we served five a day, until 10:30 of Wednesday night. Beginning again at 5 a. m. of Thursday we joined our work against that erected by the force of the West Penn division at 3:30 p. m. During this time we had erected 12 bents 14 ft. on centers, the shore bents averaging 24 ft. high and the last six bents each 43 ft. high, decked the same and laid track upon them. The working force consisted of seventeen bridge carpenters and sixteen track laborers, including all foremen.

Loading up our material we moved to Johnstown via Pittsburgh, picking up en route a second work train from my division so that our force was increased to eighty-seven men. On reporting to Mr. Miller at Johnstown at 4:30 p. m. of Friday I was taken over the work by him when he explained to me in detail what he had in view and what he expected to accomplish. I was placed in charge of the night force and at 7:20 p. m. began the work of closing up a gap in the trestle at Buttermilk Falls. The flood at this point had scoured the track and roadbed away from the side of the mountain, exposing the rock face. Steps had to be cut on which to foot the posts of the bents. Every post had to be of a special length, the material to be moved out a long distance on timber trucks, and the work to be prosecuted by the light of torches. It was a hard night's work and when relieved by the day shift we had erected but thirteen bents. On the night of the 8th my force was increased by details from the Chicago division of the Fort Wayne and the Pittsburgh division of the Pan Handle and at 5 o'clock Sunday morning we ran an engine over the trestle and moved up to Bridge No. 6. This trestle consisted of 101 bents, or about 1,500 lineal feet, averaged 15 ft. in height and was built to carry two tracks, but one of which had been laid up to this time.

On Friday night I had consolidated my two trains, shifting the timber and tool cars and placing the cooks' cars back to back with the provision cars between. It was this train that we moved forward at day-break of the 9th, taking up a commanding position at the front that was subsequently of great advantage to us. On the following day an effort was made to establish a camp near by, but the topography was so forbidding that it was abandoned, and, with the exception of my men, the forces had to be removed back and forth between Conemaugh and Bridge 6. During Saturday afternoon some timber had been taken to this point on push cars and I had detailed a small gang which during the night had begun the erection of shore bents. This work was now pushed with vigor and when we retired at 11 o'clock a. m. we had eleven bents in place and two ready for erection. We had also set up and cut in a telegraph office. The general superintendent had arranged that we should work until noon of Sunday, an eighteen-hour stretch, and the day force until the morning of Monday, thus effecting a shift of his forces without any loss of time. Of the work of the 10th on the west side of the opening my memorandum of the day shows the bents to have ranged in height from 41 ft. 8 in. to 52 ft. and to have been erected in an average time of 47 minutes to each bent or an advance of a lineal foot every three minutes. This trestle was built on a 9 deg. curve and far enough off the line to permit the subsequent construction of a stone arch bridge on the original alignment.

The timber was unloaded from the cars, cut to proper length, slid down the bank into the water where the bents were framed, floated to place and lifted with balance beams, girt stripped, stringered, and decked. We worked here the forces which I had brought with me to Johnstown. The excellence of their performance, which is said to compare favorably with any work of this character previously done in this country, I attribute to the large experience, capability and resourcefulness of the master carpenter in charge, Mr. Frank R. Martin, to the discipline which the force as a working body received, and the acquaintance and confidence it had acquired, during their isolated work at night and at the Bow bridge and not least to the very advantageous arrangements for caring for them that we had been able to effect. That night an engine was run over the bridge and the track connected with that laid from the east by the forces of the Pennsylvania Railroad.

Single track communication had now been established, but at a conference held by President Roberts, General Managers Pugh and McCrea, General Superintendent Miller, and Superintendent Pitcairn, it was decided that in view of the enormous volume of business to be moved a gauntlet protected by interlocking should be erected at Bridge 6 and the balance of the line double-tracked before it was opened for traffic. The forces were therefore redistributed, the work renewed with increased vigor, and at 9:50 a. m. of Friday, June 14, the first passenger train since the breaking of the dam, passed through, the road being in a condition to warrant its use at a speed of 30 miles per hour. It had rained every day while we were there, some of the storms being very severe. We had some 25 cases of sickness or injury during our stay, but these were promptly cared for by the company's surgeons, who also inspected the daily supplies of meat and vegetables forwarded us from Pittsburgh and looked after the cleanliness and condition of the camps and commissary trains. During the 11 days the repairs were in progress, besides the work at Bow bridge, the forces from the Pennsylvania lines west of Pittsburgh had built 3,200 lineal feet of trestle work from 15 to 52 ft. in height, laid 29,000 lineal feet of main track and 9,000 lineal feet of sidings and yard tracks, with numerous switches and connections requiring heavy grading in many places, had rebuilt the telegraph lines, connecting in the offices and stringing 85 miles of wire, erected a water tank and pumping station, had cleaned up a great amount of wreckage, and had retracked many of the engines and cars. This force was organized as follows:

J. F. Miller, General Superintendent.

Staff Officers—Thos. Rodd, Chief Engineer, North West system; E. B. Wall, Superintendent Motive Power, South West system; E. C. Bradley, Superintendent Telegraph; C. M. Bennett, Division Superintendent; W. W. Mansfield, Division Superintendent; H. I. Miller, Division Superintendent; Dr. Thos. Gallagher, surgeon.

Line Officers—One engineer of signals, seven engineers maintenance of way, 10 master carpenters, 10 supervisors of track, two chief line repairers.

Working Force—42 bridge foremen, 285 bridge carpenters, 140 shop carpenters, 41 track foremen, 680 track laborers, 3 line foremen, 45 linemen—a total of 39 officers and 1,196 men.

Since then our camp train has been out four times: In February, 1891, repairing washouts along the Ohio River; January, 1893, clearing snow blockade at Cleveland; November, 1893, trestling on the Cleveland & Marietta division, a temporary line having been built around a tunnel which was burning out. In May, 1894, the force was again sent to the P. R. R., the Conemaugh having washed out the roadbed near South Fork. So proficient does practice make, that two and one-half hours after receiving this last notice to go we were on our way, first having loaded five carloads of timber and fitted up and provisioned the train. [The bill of the material usually taken: Lists of tools carried and of camp train supplies are given. The lecture closes with an excellent account of the great strike of 1894 and the method of dealing with it.]

RAILROAD ACCIDENTS, C. & P. DIVISION, PENNSYLVANIA CO.

July 1, 1892, to Dec. 31, 1894.

Character of Accidents.	Annual average for period.		Per cent. of total per annum.		Annual average cost for period.		Percentage of cost per annum.	
	Main track.	Sidings.	Main track.	Sidings.	Main track.	Sidings.	Main track.	Sidings.
Collisions.								
Rear	2.	.4	.036	.003	$589.08	$18.60	.039	.004
Butting	2.4	1.2	.043	.008	4,015.87	73.46	.269	.012
Break-in-two	6.8	2 8	.124	.019	2,746.83	224.77	.185	.052
Crossing and Miscellaneous	4.4	4.	.081	.027	390.13	552.68	.026	.127
Total collisions	15.6	8.4	.285	057	$7,741.91	$848 91	519	.195
Derailments from								
Defects of road	2.	26 8	.036	.181	$95.93	$614.84	006	.142
Defects of equipment	20.	99.6	.365	.132	6,067.73	393 69	.407	.091
Negligence in operating	6.	55.6	.110	.376	438.46	1,416.37	.029	.326
Unforeseen obstruction	2.8	1.2	.051	.008	263.95	28 57	.018	.006
Unexplained	3.6	19.6	.066	.132	236.12	424.71	.016	.098
Total derailments	34.4	122.8	.628	.829	$7,102.15	$2,878.18	.476	.663
Accidents without collision or derailments								
To locomotives	.8	.4	.014	.003	$5.40	$ .48	.0013	.0001
To cars	2.8	15.2	.051	.103	60.74	605.60	.0041	.1394
Cars burned while running	....	....	....	....	.....	.....	.....	.....
Other causes	1.2	1.2	.022	.008	9.85	10.44	.0006	.0025
Total accidents without collision or derailments	4 8	16.8	.087	.114	$75.99	$616.52	.065	.142
Total train accidents	54.8	148.	1.00	1.00	$14,920.05	$4,343.61	100.	100.
Train mileage	2,609,677	....	....	....	.....	.....	.....	.....

TECHNICAL.

Manufacturing and Business.

The Railway Cycle Manufacturing Co., of Hagerstown, Ind., reports a recent order for one of the company's light inspection cars to go to Costa Rica and another for a sample car for the Argentine Republic, where the company has recently located an agent. It is receiving numerous inquiries in regard to cars of its manufacture from other foreign countries.

The Kalamazoo Railroad Velocipede Co. has recently received an order for a 2-H. P. gasoline motor inspection car to be shipped to Buenos Ayres, S. A., where it will be used on a road with a gage of 5 ft. 6 in. Another recent export order is for three No. 6 inspection velocipede cars, 24-in. gage, for shipment to Calcutta, India.

The Brown Hoisting and Conveying Machine Co. has contracted with the Buffalo, Rochester & Pittsburgh for a complete plant of Brown's patent bridge tramways for handling iron ore, to be erected on the railroad company's dock at Buffalo, and to be in operation about July 1.

The Chicago Pneumatic Tool Co. received an order by cable this week for 10 "B" size hammers from London.

New Stations and Shops.

The agreement for the erection of a new station by the Louisville & Nashville, at Montgomery, Ala., has been formally approved by the city authorities and the railroad officers. The accepted plans provide for improvements to cost $350,000. The main station building will be of brick, stone and iron, three stories high and 309 ft. in length. The train shed will be 600 ft. long. Separate buildings will be erected for the baggage and express offices. The freight house will occupy a third separate building 50 ft. × 400 ft. The improvements included in the contracts and to be made by the railroad are the building up and strengthening of the river bank near the station, which will cost $30,000. A street will be built under the tracks to the river landing at a further cost of $30,000, and a new street is to be built near the front entrance to the station.

A site for the new shops of the Pittsburgh & Western has been selected at Deforest Junction, two miles southwest of Warren, O. The equipment of the shops at Painesville, O., will be removed to the new site, and it is expected that the plant will be ready for operation in three months.

Work was to begin this week on the erection of the shops of the Kansas City, Pittsburgh & Gulf at Shreveport, La.

The Glens Falls Paper Co., of Glens Falls, N. Y., is making extensive alterations and additions to its plant, and on all new buildings is placing roofs supported by steel trusses. The trusses for the new work will be furnished by the Berlin Iron Bridge Company. The new buildings will consist of machine room 67 ft. × 217 ft. and 52 ft. × 167 ft.; a finishing room 50 ft. × 100 ft., and two boiler houses.

Car Coupler Litigation.

We have received the following letter from the Gould Coupler Company:

"As there appears to be a misapprehension as to the scope of the opinion of the Circuit Court of Appeals in the suit of this company against the Trojan Car Coupler Company, we desire to say that this opinion was made upon an appeal from an order granted by his Honor, Judge Coxe, granting a preliminary injunction.

"The case was tried before Judge Coxe and also on appeal solely upon affidavits, we not being permitted to reply to the affidavits filed by the defendant.

"We believe that upon a full and correct presentation of all the facts a different conclusion will be reached by the courts. We shall now commence to take testimony and proceed with the suit as though no preliminary injunction had been asked for."

New Hydraulic Brake for Street Cars.

On May 26, a trial was made of a new hydraulic brake, manufactured by the Lombard Hydraulic Brake Co., 51 Hampshire street, Boston, on one of the cars of the Brooklyn City Railroad Company. The results of trial are given as follows: With a 32-ft. car running at about 22 miles an hour, the stop was made in two car lengths from the place where the brake was applied. At 17 miles an hour the same car was stopped in 36 ft., while at the ordinary rate of speed the car was easily stopped within 6 or 8 ft.

Storage Batteries for the Englewood & Chicago Electric Street Railroad.

The batteries to be used on the 54 miles of new lines of the Englewood & Chicago Electric Street Railroad are now being made by the Electric Storage Battery Company, of Philadelphia. Each car will be equipped with 72 cells of battery, which the company claims will operate the car from 50 to 60 miles on one charge. Two sets of batteries will be provided for each car, one set being charged while the second operates the car, and the operation of replacing the discharged battery with a charged one will not occupy more than a minute of time. Mr. G. Herbert Condit, who is General Manager of the Englewood & Chicago Electric Railway Co., is also Chief Engineer of the Railroad Department of the Electric Storage Battery Co., and the work of equipping the cars is under his direction.

The Proposed East River Tunnel.

The New York and Brooklyn Railroad Company was incorporated in Albany on June 4, with a capital stock of $20,000. The Directors are Benjamin S. Henning, Alonzo B. Cornell, Otto Andreal, Fritz Hill, John D. Miller, Paul C. Schnitzer, E. R. Hoadley, Sutherland R. Haxtun and Irving Washburn. The purpose of the company is the construction of a tunnel railroad from Broadway, below Canal street, New York City, under the East River to Fulton street, Brooklyn. The incorporation of this company is merely a formality to keep alive the franchises of the company organized by the same interests in 1891.

Re-Rolling Rails.

We have described so thoroughly in the past Mr. McKenna's system for re-rolling old rails that the matter must be quite familiar to our readers. We learn that Mr. McKenna's plan for building a mill has been delayed for the reasons that have delayed so many promising enterprises in the last two or three years, but that he hopes to carry out the project soon. The Chicago, Milwaukee & St. Paul and the Santa Fe roads are so well satisfied with the rails that were re-rolled for them last year that they have promised important orders when the mill is built, and there is good prospect of other orders as soon as they can be filled. A very competent judge tells us that the re-rolled rails "are showing splendidly."

Bicycle Rack for Baggage Cars.

A bicycle rack for baggage cars has been designed by S. J. Collins, General Superintendent of the Wisconsin Central Lines, to avoid the liability to injury by chafing and swinging which bicycles are subject to if hung from the roof of the car. The rack is on one side of the car, and the bicycles stand on the floor at an angle of 45 deg. to the side. The space thus reserved is enclosed at the sides and covered by a shelf for baggage.

Changes on the Brooklyn Bridge.

Chief Engineer Martin, of the Brooklyn Bridge, states that the 56-lb. rails, which are in present use on that structure, will be entirely replaced by new ones, weighing 70 lbs. to the yard; and also that the cross ties, now on the bridge, will all be renewed. At the same time that these changes are being made, the system of shunting trains by electricity, as heretofore described in the *Railroad Gazette*, with the exception that the overhead wire will be done away with, the current being transmitted from a third rail into the motor and then into the other main track rails, will be introduced. The work wil be done at night during the months of July and August, and all improvements will be finished in October, at the latest.

A Brown Cantilever Machine for the Pennsylvania.

The Brown Hoisting & Conveying Machine Co., through its New York office, has just closed a contract with the Pennsylvania for one Brown patent rapid double cantilever machine for handling general merchandise on pier J, Jersey City, from ocean steamers to cars and from cars to steamers. This machine has been designed especially for pier "J," and will be the first special machine for the rapid handling of freight ever erected in New York harbor. It will hoist its full load of 5 tons 150 ft. per minute, and carry same 900 ft. per minute, while the entire machine will move along the pier 600 ft. per minute. It is operated by steam and is controlled by a single operator. The engines, boilers and operating mechanism are contained in a house 21 ft. square on top of the machine. An attachment for handling bulk material, such as sand, sulphur, pyrites, etc., and loading it into box cars, will be provided. The machine will be in operation about September.

The Mount Lowe Railroad in California.

The *Pacific Electrician* for April explains the novel arrangement of propulsion for the Mount Lowe Railroad. At the new power-house at Echo Mountain there is a 150-H. P. Westinghouse multipolar generator run by a 100-H. P. gas engine fed by gaspipes from Pasadena, eight miles distant. At Rubio there is an 80-H. P. dynamo operated by Pelton water-wheels with a capacity of 300 H. P., and at Altadena there is a 180-H. P. dynamo operated by a 250-H. P. gas engine fed by gasoline. The Otto engine at Echo Mountain is said to be the largest gas engine on the Pacific Coast.

Knitted Mattress.

The Knitted Mattress Company, of Canton Junction, Mass., has so perfected its compound knitting and quilting machines as to produce a quilted textile cotton fabric of different thicknesses and varying degrees of resiliency, adapted to purposes as wide apart as a soft dining-table cover and an elastic mattress for a bed. They have long been in use for both of these purposes, as well as for stair pads and general upholstery. The tendency of cotton to "mat" and harden is successfully prevented, and the fabric can be safely washed.

For railroad purposes it has had severe trial. On the Delaware, Lackawanna & Western road the car seats and backs in 50 cars were reupholstered with it as a substitute for curled hair, and have been in service for five years. The Master Car Builder now writes that he "considers it equally as good, and in some respects better than curled hair; just as durable, gives us a better shape and a more comfortable seat than curled hair, with a saving of about $30 to each car." A car seat so upholstered now invites inspection on the veranda at Congress Hall, Saratoga.

Car Lamp Litigation.

The Safety Car Heating & Lighting Company has brought suit against the firm of John Williams for alleged infringement by the Gordon-Mitchell lamp of one of the patents owned by the complainant. This suit is of considerable interest to railroads using a regenerative lamp in car lighting. In this litigation the Safety Car Heating & Lighting Company is represented by Messrs. Elihu Root, Frederick H. and Samuel R. Betts and Randolph Parmly. The firm of John Williams is represented by Mr. Edwin H. Brown, of the firm of Dickerson & Brown.

THE SCRAP HEAP.

Notes.

The wheelman's claim for free transportation of bicycles seems to rest upon bawl-bearings.—*Pathfinder.*

The Chicago, Rock Island & Pacific now makes up freight trains on the tonnage basis throughout the whole of its lines.

The Massachusetts Legislature has passed the bill authorizing the construction of the new Union station at Summer street, Boston.

Henry Jackson, the negro who tried to wreck a train near New Brunswick, N. J., May 6, has been sentenced to six years' imprisonment.

A fire at Erie, Pa., on June 6, destroyed buildings and other property of the Anchor Line to the extent of $50,000. At Loup City, Neb., June 6, several bridges were destroyed by a flood.

The Brotherhood of Locomotive Engineers, in session at Ottawa, Ontario, has decided, in the case of 20 engineers who were dismissed by the Plant system, to pay the wages of the men until they get employment.

A press dispatch from Vincennes, Ind., says that a conductor of the Evansville & Terre Haute, who left the road (or was discharged) at the time of the strike of 1894, has secured a verdict of $3,500 against the road in a suit alleging that he had been blacklisted.

The total number of deaths due to the bridge disaster at Victoria, B. C., is now reported as 55. The local newspapers have numerous statements, all of them more or less indefinite, regarding the defective condition of the bridge, which is alleged to have existed for two or three years back.

The Mayor of Jersey City, N. J., announces that that city has about reached an agreement with the Erie Railroad for the elevation of the main tracks above the grade of the streets between the terminus at the Hudson River and the east end of the tunnel. The plans have lately been completed by the engineering department of the road.

It is said that attendants in charge of horses transported on passenger trains are frequently very liberal in their treatment of tramps, giving them rides in return for help in taking care of the horses. On a prominent railroad last week a horseman with a pass for 15 persons was found to have 22 in his car, and the seven outsiders were arrested.

Annual Meeting of the Electric Storage Battery Company.

The annual meeting of the Electric Railroad Storage Battery Company was held at Philadelphia, June 4. The gross sales of the company for the year 1895 were reported to have been $328,231.40, and the margin of profits $124,733, making the profits $126,951.87, and the net profits for the year, after paying all expenses, interest, etc., $2,982.40. The business for the year amounts to over a million dollars and a gross profit of over $600,000.

The Suez Canal.

The dividend declared by the Suez Canal Company this year is 74f. 49½c., which, with the 5 per cent. interest, makes a total of 99f. 49½c. per share, whereas the dividend last year was 71f. 65c., or, with the 5 per cent. interest, 96f. 65c. The increase in the dividend is, therefore, 2f. 84½c. per share. The earnings derived from the transit of vessels through the canal in 1895 amounted to 78,426,110f., or 4,299,054f. more than in 1894.

The total receipts for the year 1895 amounted to 80,702,787f.; the expenditures of all sorts, including the 5 per cent. interest on the share capital, the redemption of shares, the interest and redemption of the loan for the improvement works, and the sum of 1,507,877f. for the purchase of new plant and the construction of buildings, amounted to a total of 37,435,762f., leaving a balance of 43,267,025f., from which it is proposed to deduct 3 per cent., or 1,298,010f., for the reserve fund. The cost of the works for the widening and deepening of the canal executed in 1895 was 3,909,187f., provided for by the issue of 25,000 bonds, the product of which will also suffice for the continuation of the improvement works during the current year.

In 1895 a total of 3,434 vessels, with a tonnage of 8,448,383 tons, traversed the canal, paying tolls amounting to 75,934,357f. The toll for the 216,938 passengers produced 2,169,385f., and the accessory earnings 322,367f., making a total for transit of 78,426,110f. Just 3,200 vessels, or 95.1 per cent. of the total shipping, used the electric light, enabling them to continue their passage through the canal during the night. In 1894 the proportion was 94.9 per cent.

The average time occupied by vessels in the canal during 1895 was 19 hours 18 minutes, and the average duration of steaming through the canal, 16 hours 18 minutes. Compared with 1894, that represents a diminution of 37 minutes in the time occupied by vessels in the canal, and 23 minutes in the actual steaming through it.

A New Ocean Record.

On Friday last, the American Line steamship St. Paul completed a record-breaking voyage from Southampton to New York, over a long southerly course, covering 3,113 nautical miles in 6 days 5 hours and 32 minutes. This beats by one hour and forty-two minutes the previous fastest record, made by the New York, over a shorter course of only 3,047 knots. The St. Paul's daily runs were 488, 522, 522, 513, 508, 519 and 41 knots, a total of 3,113 knots, equal to about 3,585 statute miles. Her average for the trip was 20.82 knots, equal to about 23.97 statute miles per hour.

Rapid Transit in New York.

Last week the Rapid Transit Commission of New York received from Messrs. George J. Gould, R. M. Gallaway and Russell Sage their plan of extension of the present elevated railroad. The propositions are only tentative. They are:

A new elevated structure of two tracks running from the Battery up West street to Little Twelfth street, thence north along Tenth avenue to Twenty-third street, where a spur will be constructed connecting the Sixth, Ninth and Tenth avenue lines and running down to the West Twenty-third Street Ferry.

A spur from Christopher and West streets running along Christopher street to the Sixth avenue line at Eighth street.

A spur from City Hall along Centre street to Canal, thence west to the Hudson River, connecting with the Sixth, Ninth and proposed West street lines.

Four tracks for the Third avenue line from Chatham Square to Ninth street, and three tracks beyond that point to the Harlem River.

Three tracks on the Second avenue line from Grand street to the Harlem River.

Three tracks on the Ninth avenue line from Cortlandt to 108th street.

A new line beginning at 108th street and Columbus avenue and running west to either the Boulevard or Amsterdam avenue to Fort George.

If the Boulevard line is chosen, where a surface road is preferable, that thoroughfare will be followed north to 135th street, when the structure will turn into New street and again come out on Amsterdam avenue and extend up to Fort George.

A new line, beginning at 162d street and Amsterdam avenue, where the Kingsbridge Road meets it, to be along the Kingsbridge Road to the city line at Yonkers.

A new line from East 149th street at its junction with the Westchester Road along the Westchester Road to the Edgewater Road on the Bronx River, with the intention of pushing the structure further east, later to West Farms.

A new line from 177th street, Tremont, station north along the Fordham Road to the southerly end of St. John's College grounds.

South American Notes.

The Central Railroad of Brazil is about to place orders for 40 first-class passenger cars, 20 second-class passenger cars, 6 sleeping cars, 90 coal cars, 50 cattle cars and 10 horse cars.

The Central Argentine Railroad reports a steady gain in receipts, with diminished operating expenses. It has recently opened a new branch line from Pilar to Villa del Rosario, 21 miles in length. This branch is notable from the fact of its low cost among the English-built roads of Argentina, being only $7,500 a mile. It is laid with 42-lb. rails, is well ballasted, and is designed for heavy traffic at low speeds.

Steel sleepers are being adopted as standard by the Southern Brazilian Rio Grande do Sul Railroad (175 miles in length). The Indian Government type of sleeper, weighing 69 lbs. is being used. Already 106,000 have been laid, and old sleepers are being replaced by steel at the rate of 40,000 a year. The traffic on this line has so increased since the late revolutionary outbreaks in this state that a dividend of 5½ per cent. has been paid as a result of last year's working. Indications for the future are rendered brighter by the growth of a healthy balance between inward and outward freight movements over the line. In 1888 the inward freights amounted to 78 per cent. of the total movement. This has gradually changed until in 1895 the inward traffic was 50 8 per cent., against 49.2 per cent. toward the coast.

An important change in the industrial development of Argentina is becoming notable, as indicated by the railroad traffic returns. Owing to the peculiar shape of the country, and the distribution of natural water routes, the heaviest traffic has heretofore moved along approximately north and south lines. It has been contended by many that such conditions must necessarily change with the development of the country, and that the proximity to water would ultimately cease to be the governing factor in natural growth. This change would seem to have come. The Buenos Ayres & Pacific, and the Argentine Great Western, east and west lines, have now reached a point where receipts exceed $110 a mile, while the Buenos Ayres Great Southern, the Buenos Ayres and Rosario, and the Central Argentine, north and south lines, are all below $105 a mile. It is significant that the Buenos Ayres Great Southern, having extensively developed the maritime districts between Buenos Ayres and Bahia Blanca, is now beginning to build westward toward the Chilian frontier, into the territory of Neuquen.

The municipality of Buenos Ayres is considering the issue of $20,000,000 in bonds to provide funds for repaving the city.

Cave-in on the Northern Pacific.

About 300 ft. of the track of the Northern Pacific, Cedar Lake, near Aitken, Minn., fell into the lake on May 30. On account of the heavy rains during the past few months, the ground has become very soft, and finally a section of the track dropped through into the lake. It did no material damage and delayed the trains but a few hours. It will cost but a very small amount to put the track in good condition.

Lake Notes.

The report of the American and Canadian Sault canals for May is a surprise, for it shows that in but two months in the history of the canals has more traffic passed through. Usually the largest traffic of the year is in July and August, and last August, the greatest month in the canals' history, passed only 30,000 tons more than the month now reported. The total business was 2,467,651 tons of freight, on 3,021 vessels of all classes, with a registered tonnage of 2,882,526 tons. About 25 per cent. of the freight passed through the Canadian Canal.

The new whaleback steamer Rockefeller was loaded with its first cargo last week at Duluth, and it took 3,773 net tons, on an average draft of 14.1 ft. The steamer towed a barge which carried 4,000 tons.

Contracts for next year's lake shipping are already being placed, one yard having taken a vessel of the largest size to be completed for the opening of navigation.

At Duluth last week one of the Northern line ships unloaded out of the hold 43 tons of coal per hour per hoist. At the same point 2,150 tons were taken out of the Centurion in 10 hours.

Besides the 16 ships now under way for the Bessemer Steamship Co., it is stated that the building of two more 4,000-ton barges is contemplated.

The season's service of the Northern line's two passenger ships, North West and North Land, began this week, Tuesday, at Duluth. A very busy season is looked for, and it is hoped the vessels will begin to return a profit, something they have not been able to do with all the careful attention that has been given to them.

Westinghouse Electric Company's Capital.

At a special meeting of the stockholders of the Westinghouse Electric & Manufacturing Company, held on June 5, it was formally voted to increase the capital stock of the company from $10,000,000 to $15,000,000.

The Twenty-third Street Ferry of the Pennsylvania.

The Pennsylvania has begun driving piles for the foundations of the new ferry station which it will construct at the foot of West Twenty-third street, New York City. Before the end of the year it is expected that the ferry will be running between West Twenty-third street and the Pennsylvania's Jersey City terminal. Contracts for the two double-decked ferryboats, which are being built in Philadelphia, call for their completion on Dec. 1, but the boats will be ready for service a month before that time.

European Passenger Cars.

The statement has been made that on the state railroads in Germany the carriages are painted according to the colors of the tickets on their respective classes. First-

class carriages are painted yellow, second-class green and third-class white. Commenting on this the editor of the *Travellers' Official Guide* says:

"The writer of the above item evidently has never seen a German railway carriage. In Germany, and in fact in all Europe, including Great Britain, railway carriages are divided into compartments by solid partitions extending entirely across the body of the car. A single car has one or two third-class compartments, a similar number of second-class, and perhaps one first-class. The class is indicated by numbers on the entrance doors. The appearance such cars would present painted in alternate streaks of yellow, green and white, as indicated by the above quoted paragraph, would be absurd in the extreme. On some of the German state roads the numbers indicating the class are on movable signs, so that a second-class compartment may be changed into first-class by altering the sign.

"The local passenger coaches used in Switzerland, however, are more like American cars, having a middle corridor. The seats face each other as in the sleeping cars here, and are immovable. Such coaches are divided into compartments for smokers and non-smokers, about two-thirds of the carriage being devoted to the smokers. The sleeping-cars are almost exactly like our Mann boudoir cars, but are not so large.

"On some roads in Great Britain there are no second-class tickets sold. The compartments are either first or third-class. Workmen's trains are run with coaches which contain third-class compartments only. In some cases, in these third-class coaches, the partitions do not extend to the top of the car, an open space being left next to the ceiling. In recently built coaches on the Continent there are small glass windows of a triangular shape near the top of the partitions between the compartments, so that it is possible to look from one compartment into the next in case of emergency. As a rule, however, the partitions are solid. A toilet room is often located adjoining the partition so as to admit of its use from either compartment.

"The coaches are not nearly so well ventilated nor as well lighted as in this country. Oil lamps are generally used. Pintsch gas is also in use, but, as compared with American practice, with an insufficient number of burners."

The foregoing explanation omits to compliment the German railroad men on the alertness with which they can, with the movable sign, change a second-class compartment into a first-class "while you wait." American travelers have been surprised at the facility with which German conductors avoid the necessity for refunding a first-class passenger a part of his money, when there were only second-class compartments available. Whether first-class compartments are ever "adapted" to second-class passengers is a question on which there seems to be a dearth of information.

New Tunnel at Chicago.

In a few days, it is expected that the new tunnel of the Chicago water-works system, extending from the west end of the government piers out into Lake Michigan to the two-mile crib, a distance of 6,045 ft., will be ready for service, thus insuring to the city a large additional supply of water.

The Newfoundland Railroad.

Work on the railroad across Newfoundland Island to Hall's Bay has been resumed, and it is hoped to complete the road this summer. One hundred and thirty miles of the line remain unbuilt.

A "Bicycle Railroad."

At Ridgeway, Ont., a few miles west of Buffalo, a company, of which Thomas Snyder is President, is building a railroad about 1¼ miles long on which the cars are to be supported by a single rail. On either side of this rail, and about four inches lower, are guide rails to keep the cars in position. The cars weigh about 3,000 lbs. each and have seats for 18 passengers each. They are to be propelled by electric motors, supplied with power from storage batteries, and the establishment is called a "bicycle railroad."

LOCOMOTIVE BUILDING.

Of the recent order received by the Baldwin Locomotive Works from the Russian Government for 60 locomotives, 35 are completed and ready for shipment. Within a month the rest of the order will be ready for shipment. The only other contract of any importance on hand is the building of 25 locomotives for the Lehigh Valley.

CAR BUILDING.

The Ensign Manufacturing Co., of Huntington, W. Va., has been awarded the contract for building 100 thirty-ton standard hopper bottom gondola coal cars for the Chesapeake & Ohio.

The Brooklyn Heights electric road, which controls over 200 miles of track in Brooklyn, N. Y., has recently added to its equipment a third parlor or theater car, similar to the "Amphion" illustrated in our issue of Jan. 24 last. The new car has been named "Columbia" and was built by the J. G. Brill Co., Philadelphia, Pa. The principal dimensions are: Length over end panels, 24 ft.; width at sill, 7 ft., and width at belt rail, 7 ft. The platforms also are 7 ft. long.

BRIDGE BUILDING.

Atlantic City, N. J.—William Bowker, who has a pavilion on the line of the new steel walk, has served notice on the construction gang of the Phœnix Bridge Co. not to enter upon his premises. The city officials say the walk will be built up to Bowker's property line on the north side and continued from the south side, and the pavilion will remain till the right of way has been secured by condemnation.

Bloomfield, N. J.—The County Board of Freeholders has decided to erect a new bridge over the canal, according to reports. Thomas McGowne is one of the Freeholders.

Buffalo, N. Y.—The Council has ordered the Board of Public Works to advertise for bids for a bridge over the Scajaquava Creek at Florida street, another over the same creek at Bailey avenue and also at Karl street.

Chicago.—The Atchison, Topeka & Santa Fe and the Chicago Drainage Canal Board have reached a settlement, by the terms of which the Atchison agrees to change its right of way and build three bridges, all of the work to be paid for by the Drainage Board. The cost is estimated at $400,000.

Cleveland, O.—Bids were received as follows for building the South Rocky River bridge: King Bridge Co., $124,000; Canton (O.) Bridge Co., $125,000; Massillon (O.) Bridge Co., $126,000; Mt. Vernon Bridge Co., $127,000; Youngstown (O.) Bridge Co., $128,000; McAllister & Dall, $94,000. The contract was awarded to McAllister & Dall, who sublet the work to the King Bridge Co. for $84,000.

Conneautville, Pa.—A new bridge is being erected over the Conneaut Creek at Centre street.

Duluth, Minn.—The Duluth-Superior Bridge Co. has advertised for bids for building the bridge between Duluth and West Superior. The total length of the bridge, including approaches, will be 1,300 ft., and the width 58½ ft. There will be two fixed spans of 302 ft. each and a draw span of 483 ft. It is said that the turning power will be electricity. The bridge will carry two railroad tracks, two roadways with tracks for electric cars and two sidewalks.

Flushing, N. Y.—The contract for the new bridge over Strong's Causeway, to connect the towns of Flushing and Newtown, has been awarded to the Berlin Iron Bridge Co.

Hackensack, N. J.—The Bergen County Freeholders have appropriated $40,000 for building county bridges during the next year.

Lead City, S. D.—The Homestake Mining Co. has awarded the contract for a viaduct 855 ft. long to the Pittsburgh Bridge Co.

Little Rock, Ark.—Bids will be received by the Commissioners until June 22 for building the proposed bridge over the Arkansas River, to cost about $25,000. Edward Thacher, Detroit, Mich., is Consulting Engineer.

Macon, Ga.—The contract for building the bridge over the Ocmulgee River has been awarded to the Ohio Bridge Co., for $16,000.

Millville, N. J.—The contract for rebuilding the Main street bridge over the Maurice River at this place has been awarded to the Delaware Construction Co., of Wilmington.

Minneapolis, Minn.—Bids were received as follows for the proposed Seventh street viaduct, the estimated cost of which was $36,000; A. & P. Roberts Co., Philadelphia, $34,000; Edge Moor Bridge Works, $35,900; American Bridge Works, Chicago, $36,250; Chicago Bridge & Iron Co., $33,000; C. L. Stroebel, Chicago, $32,900; Detroit Bridge & Iron Works, $32,566; Lassig Bridge & Iron Works, Chicago, $35,700; King Bridge Co., $32,700; Penn Bridge Co., Beaver Falls, Pa., $31,275; Shiffler Bridge Co., Pittsburgh, $31,794; Youngstown (O.) Bridge Co., $33,298; Wrought Iron Bridge Co., Canton, O., $31,477; Andrew Rinker, Minneapolis, $35,750; Wisconsin Bridge & Iron Co., Milwaukee, $30,470; Milwaukee Bridge & Iron Works, $30,648; Toledo Bridge Co., $32,984; Gillette-Herzog Manufacturing Co., Minneapolis, $31,485; Universal Construction Co., Chicago, $39,699.

New York.—The annual meeting of stockholders of the New York & Long Island Bridge Co. was held at New York City on June 1. The former Board of Directors was re-elected as follows: James J. Byrne, William G. Bosworth, George A. Hamilton, Henry M. Conover, Edward J. Boyle, James J. Noonan, Joseph F. Keany, James Grahame Gardiner, George W. Quintard, James R. Cuming, Jacob P. Miller, Daniel M. Rollins and Herbert C. Smyth.

Work is progressing on the bridge, which is to be built across the East River and Blackwell's Island, and will give the Long Island Railroad direct communication with that city.

The New East River Bridge Commission met June 3 and discussed the proposed terminals for the bridge. It was decided to give public hearings on the subject before the mayors of both cities. The hearing in New York was held last Wednesday and in Brooklyn on Thursday. Mr Buck presented plans for terminals and approaches. The Commission re-elected its officers to serve during the ensuing year. They are: Andrew D. Baird, President; Salem H. Wales, Vice President, Richard Deeves, Treasurer, and Francis B. Thurber, Secretary.

Pembroke, Me.—The bridge over the Pennamaquan River will be replaced by a steel structure. The contract for building the new bridge has been given to the Berlin Iron Bridge Co. for $670.

Philadelphia.—The Fairmount Park Transportation Co. has made a contract with the Franklin Engineering Co. for the building of an ornamental steel bridge over the Schuylkill River at Strawberry Mansion. The price agreed upon, $485,000, is for the structure complete, including its approaches and a bridge over the Reading Railroad tracks on the west side of the river.

St. Charles, Mo.—The President has approved the bill for a highway bridge here over the Missouri River. It will be built by the St. Charles & St. Louis County Bridge Co., recently organized.

St. Joseph, Mo.—Bids will be received till June 22 for building seven county bridges. W. B. Hazen is County Surveyor.

St. Louis, Mo.—Congressman Stewart, one of the three House conferees of the St. Louis Bridge bill, now refuses to sign the report agreed on by the Senate and House conferees for reducing the limit from five-eighths to one-half mile from either of the existing bridges. Congressman Patterson, another of the conferees, is away, and therefore nothing can be done regarding the matter for the present.

Steelton, Pa.—Jacob W. Hocker, of Cowl's Valley, has been given the contract for the masonry of the new Franklin street bridge, for $1,539.

Pittsburgh, Pa.—An agreement has been reached under which the city is to purchase the Point Bridge for $400,000.

Woodstock, N. B.—Bids will be received until June 25 for a three-span steel bridge 154 ft. long over the Maduxnakeag River. Daniel Monroe is Superintendent.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Texas it is held that the erection of buildings on land, over which a right of way has been conveyed to a railroad company, by the owner in fee, is inconsistent with the rights of the company, though it has no specific use to which it expects to put the ground.[1]

In Minnesota it is laid down that the erection and operation of a public elevator and warehouse on land acquired by a railroad by condemnation for public purposes, either by itself or its lessee, do not constitute a misuser or an abandonment of its easement therein.[2]

The Federal Court rules that trustees under a railroad mortgage, who are given power to sell certain lands on such terms and conditions as they deem best, have power to warrant the title to lands sold.[3]

In Texas possession of a railroad sold by a receiver appointed by a federal court was not delivered until some time after the sale. Between the sale and the delivery of the property, plaintiffs' action for death of their intestate arose. The Supreme Court holds that plaintiffs' action was not barred by a failure to present their claim to the federal court for allowance, in accordance with an order of the court requiring a presentation of all claims within a certain time, under penalty of their being barred.[4]

The Supreme Court of Georgia decides that a license by one railroad to another company operating a narrow-gauge railroad to use a right of way did not authorize the licensee to operate a standard-gauge railroad thereover.[5]

The Supreme Court of Georgia holds that a provision in a railroad charter that no other railroad should run in the same direction within 20 miles of the road without the company's consent meant that no other parallel road should run within that distance, and hence did not prevent the building without the company's consent, from either of the terminal points of the road, of a road which ran in a direction different from that of the first company's road, though the new road, in converging to or from the terminal point, approached within 20 miles of the old road.[6]

In Texas it is laid down that where a railroad is authorized to hold land necessary to accomplish the object of its incorporation it may purchase a survey of land adjacent to its right of way, from which to obtain gravel to keep its roadbed in repair.[7]

The Supreme Court of the United States decides that the laws of Florida do not render ultra vires a contract by a railroad company to lease a hotel at the terminus of its road, situated on a beach, distant from any town.[8]

Injuries to Passengers, Employees and Strangers.

In Wisconsin in an action for wrongful ejection, the evidence was undisputed that plaintiff bought a first-class ticket, got in the caboose of a freight train, and offered his ticket to the conductor, who refused to accept it, and put him off on his refusal to pay cash fare. There was conflicting evidence that defendant sold passenger tickets on its regular freight trains, and that plaintiff told the agent, when he bought his ticket that he wanted to go on the first train, freight or passenger, and that the agent when the train came in told him it was his train, and he could take it. The Supreme Court holds that the evidence warranted a verdict for plaintiff.[9]

In Texas it appeared that plaintiff, an officer, boarded the rear platform of defendant's car to ride from one depot to another within the city, to watch for escaped prisoners; that persons frequently rode between these points; that the conductor came out to the platform, asked plaintiff what he was doing there, and, on being answered "Nothing," used some abusive words, and pushed plaintiff off the steps while the train was moving between eight and ten miles an hour; that plaintiff was considerably bruised, being under a physician's treatment for ten days thereafter. Defendant's witnesses testified that the train was not in motion when plaintiff was ejected, that he was standing up as the train left him, and that the conductor used no unnecessary force. The Supreme Court holds that a verdict for actual damages was proper.[10]

In California the Supreme Court rules that a complaint in an action for injuries caused by failure of defendant to stop its train at a station long enough for plaintiff to alight, which alleges that plaintiff was acquainted with the station, and knew that the platform was 26 inches below the car steps, and that trainmen always assisted women to alight; that she saw that the train was moving before she left the car; that, on reaching the platform, seeing that the train was moving faster, and no one to assist her, she was seized with fear that she would be carried past her station, and proceeded down the steps, and was thrown off—is demurrable as showing contributory negligence.[11]

In Kentucky it is decided that where a passenger, after the conductor calls out the name of his station, and says "all out for" such station, gets off the train several hundred yards before it reaches the depot, and while running at a high rate of speed, he is guilty of such negligence as precludes a recovery for injuries received.[12]

In Indiana the Supreme Court rules that an employee on a construction train having knowledge that the rails were half tied and were laid without ballast, cannot recover for injuries by the derailing of cars, in the absence of evidence that the defects where the accident occurred were different from those all along the unfinished track, or were otherwise than such as are incident to all railroads in the course of construction.[13]

In the same state it is said that where a cattle chute is constructed in dangerous proximity to a railroad track, the defect is not one of the risks assumed by a fireman.[14]

In Massachusetts it is ruled that a custom of a railroad in sending cars upon a side track, on which trains are being made up, at the speed of 12 miles an hour, is unreasonable, and employees will not be held to have assumed the risk of injuries therefrom.[15]

In the same state it is decided that an employee, killed while pushing a hand car on a trestle, the planks of which were laid crosswise and extended beyond the rails, through being thrown from the trestle by the breaking of a plank, did not assume the risk resulting from the defects in the plank.[16]

In a case in the Supreme Court of the United States for injuries received at a crossing, there was evidence that plaintiff, who was driving slowly and with a safe horse, stopped at a point more than 600 ft. from the crossing, from which a train could be seen, to look or listen, but, neither seeing nor hearing anything, drove slowly up a hill between there and the crossing, to a point at the top between 40 and 50 yds. from the track, where she again stopped and listened, but, hearing nothing, she then drove slowly down the hill toward the crossing, both she and her companion listening all the time without talking; that they heard nothing; and that, as they got to the cut in which the track ran, and when the horse had his feet on the nearest rail, the train, which was several minutes behind time, came round a curve and struck them. It appeared that, between the point at which plaintiff first stopped and the crossing, there was no point from which the track could be seen, and that the train did not whistle, as required by law. The court rules that the conduct of plaintiff was not, as matter of law, such as to defeat a recovery.[17]

In Texas it is held that a person riding on the front footboard of a switch engine at the invitation of the engineer is guilty of such contributory negligence as to prevent his recovery for injuries received on account of the engineer running the engine at a reckless rate of speed.[18]

In Massachusetts plaintiff stopped on reaching defendant's tracks at a crossing and waited for the keeper to raise the gate. There were several parallel tracks, and on those nearest to plaintiff were cars obstructing the view of other tracks. After several trains passed the keeper raised the gates and another vehicle crossed ahead of plaintiff, and plaintiff, while crossing, after having looked south along the tracks, was struck by an engine coming from the north. The Supreme Court rules that plaintiff was not guilty of contributory negligence.

In Wisconsin it is held that one employed by the owner of a railroad to repair a bridge under which the road runs, knowing that trains would be operated during the work, and that it would be necessary to work on the track, and clear it of timber when a train approached, who, when a train running 18 miles an hour had approached to within 80 feet of him, undertook, at the call of the engineer, to remove a skid from the track, cannot recover for injuries from being struck by the train.[20]

In Kentucky it is ruled that one who voluntarily assisted a station agent for 18 months was bound by rules of the company regulating the conduct of station agents, so that, in an action for injuries received while rendering such assistance, the company could show such rules.[21]

In the Supreme Court of the United States it is held that a railroad is not bound to protect employees engaged in shifting cars in its yard further than by providing competent co-servants, and prescribing such regulations as experience shows may be best calculated to secure their safety.[22]

In Texas it is said that if an employee is injured by the explosion of a locomotive boiler, not by reason of any defects in it, but by reason of an excessive head of steam, the company is not liable.[23]

The Supreme Court of Michigan rules that where water froze upon the tracks, causing the derailment of a car, and killing an employee, the question of defendant's negligence, in not foreseeing the danger and providing a drain, is, on conflicting evidence, for the jury.[24]

In Louisiana it is held that a railroad whose foreman, in hiring and discharging men, discriminated against those disposed to deal at plaintiff's grocery, with intent to injure plaintiff's business, was not liable in damages, since the wrongful conduct of the foreman was not within the scope of his duties.[25]

[1] Olive v. S. & E. T., 33 S. W. Rep., 139.
[2] Gurney v. Minn. U. E. Co., 65 N. W. Rep., 136.
[3] Dubuque & S. C. v. Pierson, 70 Fed. Rep., 303.
[4] San Antonio & A. P. v. Bowles, 32 S. W. Rep., 880.
[5] Augusta & S. v. A. S., 23 S. E. Rep., 501.
[6] Augusta & S. v. A. S., 23 S. E. Rep., 301.
[7] Small v. McMurphy, 32 S. W. Rep., 788.
[8] J., M., P. R. & N. Co. v. Hooper, 16 S. Ct., 379.
[9] Boehm v. D. S. S. & A., 65 N. W. Rep., 506.
[10] M., K. & T. v. Sanders, 33 S. W. Rep., 215.
[11] T., St. L. & K. C. v. Wingate, 42 N. E. Rep., 477.
[12] L. & N. v. Depp., 33 S. W. Rep., 417.
[13] Evansville, etc., R. R. v. Henderson, 42 N. E. Rep., 216.
[14] N. Y. C. & St. L. v. Ostman, 41 N. E. Rep., 1037.
[15] Caroh v. B. & A., 42 N. E. Rep., 112.
[16] Houlihan v. Conn. River, 42 N. E. Rep., 108.
[17] B. & O. v. Griffith, 16 S. Ct., 105.
[18] Wilcox v. S. A. & A. P., 33 S. W. Rep., 379.
[19] Conaty v. N. Y., N. H. & H., 42 N. E. Rep., 103.
[20] Writt v. G. L. Co., 65 N. W. Rep., 173.
[21] Helm v. L. & N., 33 S. W. Rep., 596.
[22] C. R. R. of N. J. v. Keegan, 16 S. Ct., 969.
[23] Tex. & P. v. Thompson, 70 Fed. Rep., 944.
[24] Balhoff v. Mich. Cent., 65 N. W. Rep., 892.
[25] Graham v. St. Charles, 18 South. Rep., 707.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Lowell, ½ per cent., payable July 1.
Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent. on preferred stock, payable July 1.
Chicago & Northwestern, 1¾ per cent. on preferred stock, payable July 6.
Columbus, Hocking Valley & Toledo, half yearly, 2½ per cent. on preferred stock, payable July 1.
Denver & Rio Grande, 1 per cent. on preferred stock, payable June 30.
Des Moines & Fort Dodge, yearly, 6 per cent. on the preferred stock, payable Aug 1.
Northern Central. 3 per cent., payable July 1.
Providence & Worcester, quarterly, 2½ per cent., payable June 30.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Millers' Coal & Railroad Co., special, company's office, Newcastle, Jefferson County, Ala., July 6.
Northern Railroad of New Jersey, annual, company's office, Englewood, N. J., June 17
West Jersey & Seashore, special, company's office, southeast corner Delaware and Federal streets, Camden, N. J., June 15.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its next convention at Congress Hall, Saratoga Springs, N. Y., beginning June 17. The rates at Congress Hall are $3 a day for single rooms.
The *Master Mechanics' Association* will hold its next annual convention at Congress Hall, Saratoga Springs, beginning June 22.
The *American Street Railway Association* will hold its annual convention at St. Louis on Oct. 24 and 25.
The *Roadmasters' Association of America* will hold its next annual meeting at the Cataract Hotel, Niagara Falls, N. Y., beginning Sept. 8.
The *American Society of Civil Engineers* will hold its annual convention at San Francisco, beginning on or about June 30.
The *Canadian Society of Civil Engineers* will hold a pecial summer meeting at Toronto beginning June 17.
The *Traveling Engineers' Association* will hold its next annual meeting at Minneapolis, Minn., commencing Sept. 8.
The *Roadmasters' Association of America* will hold its next annual convention at Niagara Falls, beginning on Sept. 8.
The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago. Mr. George M. Basford, is secretary, The Rookery, Chicago.
The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.
The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m., except in June, July and August.
The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.
The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March May, September and November, at 2 p. m.
The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.
The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.
The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.
The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.
The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736–1739 Monadnock Block, Chicago.
The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.
The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.
The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.
The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.
The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.
The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.
The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at p. m.
The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.
The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.
The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.
The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.
The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.
The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.
The *Engineers and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.
The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary of the association.
The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.
The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.
The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.
The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.
The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The St. Louis Railway Club.

The regular monthly meeting of the St. Louis Railway Club will be held to-day, June 12, at 8 p. m., in the parlors of the Southern Hotel. After the business session the club will be addressed by Mr. Frederick W. Lehman. The Executive Committee has appointed a committee to arrange for subjects for discussion for future meetings of the club. The committee appointed is as follows: W. G. Besler, Chas. B. Adams, J. B. Johnson and Frank Rearden. Members who have subjects to propose are requested to communicate with the Chairman of this committee, W. G Besler, who can be addressed care of C., B. & Q. R'y., Beardstown, Ill.

The first issue of the official proceedings of the club will be printed and issued about June 20, and members can expect to receive a copy of same shortly after that date.

American Society of Civil Engineers.

A regular meeting of the society was held Wednesday evening, June 3.

PILE DRIVING.

Prof. W. H. Burr described some experimental pile driving through new stone-filled crib work. Nineteen piles were driven. The crib had an extreme depth of 35 ft., and the piles were from 52 ft. to 60 ft. long. These were driven through the crib and into what was either rock or its equivalent, say, perhaps, cemented gravel. The piles were driven with a hammer weighing 3,500 lbs., and the greatest number of blows to drive any one pile was about 350. There was no difficulty in driving the piles, and no failure in any case; it was simply an example of heavy pile driving. The piles were shod with chilled, cast-iron points. These shoes were in the form of a four-sided pyramid and held by straps spiked to the pile. The instance was given as an interesting one of heavy pile-driving, but not as new experience.

Mr. George S. Greene, Jr., Superintendent of the Dock Department of New York, said that in his department piles were often driven through old crib work and through riprap. The shoe used in the Dock Department is conical, the angle of the point being about 60 deg. The base of the cone is flat, so as to give a broad bearing surface at the foot of the pile, and it is secured to the pile by a pin cast as part of the shoe, which is let into the end of the pile. This shoe first became known to Mr. Greene in 1847 or 1848, when his father used it to drive piles for the foundations of a bridge over the Androscoggin River in Maine. The bottom of the river was covered with waterlogged slabs, making difficult driving. Mr. Greene believed that his father got this shoe from an old French book. Mr. Greene had driven piles with this shoe through a bank of riprap on the East River at Sixty-second street, the riprap being more than 40 ft. thick.

Mr. W. R. Hutton has used the same form of shoe and considers that its great advantage is the flat bearing surface against the foot of the pile, agreeing with Mr. Greene that this form of shoe is least likely to burn.

Mr. L. L. Buck had used the same shoe, having got it from the Dock Department. As he used it, however, the base of the cone was somewhat hollow to receive the end of the pile.

Mr. Rudolph Hering said that the facility of driving piles through crib work depends a good deal on the nature of the fill. Naturally, the stones are more easily displaced when they lie loose, also when they are of comparatively small dimensions. In the cases cited by Professor Burr and Mr. Greene the stones were about 16 in. extreme dimensions, although Mr. Greene said that this was a very difficult specification to control. Mr. Hering had recently been driving piles through the bottom of a cyprus swamp full of stumps, making difficult driving. The piles generally went through the stumps without much trouble.

Mr. Hering had recently received from Professor Kreuter, of the Technical High School in Munich, a paper which is a contribution to the Institution of Civil Engineers (London). Professor Kreuter explains a new method for determining the bearing power of piles. He arrives at a formula by comparing the results of different energies. He uses a hammer of a constant weight, falling through different heights and causes the energies to vary between as wide limits as practicable. Other conditions are as nearly constant as possible. In this way he arrives at the following formula:

$$L = \frac{h_1 - h_2}{D_1 - D_2} W;$$ where

L = Bearing power.
W = Weight of hammer.
h_1 and h_2 = Fall of hammer.
D_1 and D_2 = Penetration under respective hammers.

which formula has been shown by more recent actual experience to be quite reliable.

Professor Burr explained that the form of shoe used by him in the experimental driving had been selected because it was the one that the contractor had proposed to use. He had stipulated, however, that if it gave trouble the Dock Department shoe should be used. He had every reason to believe that every pile went into solid material, as the penetration of the piles agreed very closely with the results got by sounding. He asked if Mr. Greene had driven braced piles through cribs.

Mr. Greene recollected no example of driving braced piles through cribs, but had driven them through the 40 ft. of riprap at Sixty-second street successfully.

The paper of the evening was by Mr. Charles O. Brown on "The Engineering Features of the Proposed New Building Laws for New York City."

PERSONAL.

—Mr. William Lowe, Master Mechanic of the Toledo Division of the Pennsylvania, died at his home, at Toledo, last week.

—Mr. George W. Disman, who has been General Superintendent of the Lima Locomotive & Machine Works for the last 25 years, retired on June 1.

—Mr. Frank M. Ware has been appointed Superintendent of Chesapeake & Ohio terminals at Cincinnati, including the coal plant recently acquired.

—Mr. Charles A. Parker, for some time Superintendent of Telegraph of the Denver & Rio Grande, has resigned to go to the Western Union Telegraph Company at Denver.

—Mr. W. C. Walters, formerly with the Erie, has received the appointment of Joint Agent of the Mexican Central and Mexican National in Europe, with headquarters in Liverpool.

—Mr. A. C. Ridgway, Assistant Superintendent of the second and third divisions of the Denver & Rio Grande, has been appointed Superintendent of the Florence & Cripple Creek road, vice Mr. J. F. Collins, resigned.

—The Board of Directors of the Atchison, Topeka & Santa Fe has elected Price, Waterhouse & Company, of New York, independent auditors, to examine and certify to the accounts of the corporation for the current fiscal year.

—Mr. H. F. Dowst, who was recently appointed Division Superintendent of the Main Central lines east of Bangor, resumed the duties on June 1. He has been the company's agent in Bangor, and will continue in that office.

—Mr. George H. Campbell has been appointed Superintendent of Terminals of the Baltimore & Ohio road at Baltimore, Md. He has recently been General Agent of the Chesapeake & Ohio and Big Four roads at Cincinnati.

—Mr P. M. Arthur has been elected Chief of the Brotherhood of Locomotive Engineers for another term of four years. He has held this office since 1874. The vote for Mr. Arthur was three times as large as that for his only competitor.

—Mr R. H. Aishton has been appointed Superintendent of the Northern Iowa Division of the Chicago & Northwestern, with headquarters at Eagle Grove, Ia. Mr. W. H. Graves has been appointed Assistant Superintendent, to succeed Mr. Aishton.

—Mr. N. D. Miller, formerly Chief Engineer and now a consulting engineer for the Great Northern, has been appointed Chief Engineer for the Yankton & Norfolk railroad bridge across the Missouri River at Yankton, S. D., to push the work to an early completion.

—Mr. C. J. Clifford, Master Mechanic of the Calumet & Blue Island road, with headquarters at South Chicago, has been appointed Superintendent of Motive Power of the Chicago, Lake Shore & Eastern, which has taken over the property of the former company.

—Mr. George D. Perkins, one of the Railroad Commissioners of Iowa, was stricken with paralysis at Des Moines last Saturday, and at last accounts was reported in a serious condition. Mr. Perkins is 60 years old and is now serving his second term as Railroad Commissioner.

—Maj. A. L. Landis, who took an active part in the building of the Nashville & Chattanooga and was a former Director and Superintendent of the Northwestern Division of that road, died in Nashville, Tenn., last week in his seventy-third year. He was a member of the Tennessee Senate for two terms.

—Captain G. W. Gloster, Locating Engineer for the Kansas City, Shreveport & Gulf, who has just completed the location of the line from Shreveport to Beaumont, Tex., has been appointed Assistant Chief Engineer of the Kansas City, Pittsburg & Gulf, of which the Kasas City, Shreveport & Gulf is the Louisiana Division.

—Mr. E. F. Osborn, Treasurer of the Cleveland, Cincinnati, Chicago & St. Louis, completed 24 years of service with that company on June 1. In honor of the event he was entertained at dinner on the evening of that day by various officers of that company, and received a loving cup from Mr. Ingalls on behalf of the officers.

—Mr. G. R. Tuska, Assoc. M. Am. Soc. C. E., has been appointed Chief Engineer of the Panama Railway Company. Mr. Tuska has for some time been instructor in civil engineering at Columbia College and has, besides, been doing consulting engineering work in private practice. He will resign his position at Columbia, but will continue his private practice.

—Mr. A. G. Craig, Division Freight Agent of the Alabama Great Southern at Birmingham, Ala., has resigned, and will return to his former home, Charlotte, N. C., to engage in business for himself. The position has been offered to Mr. Thomas F. Steele, who formerly held the office for several years, but who is now Commissioner of the Walker County Coal Association in Alabama.

—Mr. Murray B. Augur, Trainmaster of the Lehigh Valley, has been transferred from the Elmira, Cortland & Northern division to the Buffalo division, with headquarters in Buffalo, to fill the vacancy caused by the promotion of Mr. L. L. Van Allen to the office of Superintendent. Mr. Augur was formerly Secretary to General Superintendent Wilbur and was made Trainmaster at Cortland, N. Y., in March last.

—Mr. C. Haile, General Freight Agent of the Missouri, Kansas & Texas, having resigned that office to become a member of the Board of Administration of the Southwestern Traffic Association, as a representative of the Missouri, Kansas & Texas, the office of General Freight Agent of the company has been abolished. Mr. D. Miller, General Traffic Manager of the company, will hereafter have direct charge of the freight department.

—Mr. J. H. Barrett, recently General Superintendent of the Cleveland, Akron & Columbus, is now Division Superintendent of the Southern Railway. He has charge of the road between Birmingham and Atlanta, which was formerly included in the old Fifth Division, now divided, the road between Brunswick and Atlanta remaining in charge of Mr. W. R. Beauprie as Superintendent.

—Mr. E. E. Gerkins has been appointed Assistant General Freight Agent of the Michican Central, with headquarter at Bay City, in charge of the Mackinac Division. Mr. W. L. Benhan, the present Assistant General Freight Agent, has resigned, to accept a position on the Great Northern. Mr. Gerkins has been in the Freight Department of the Canada Southern and Michigan Central for some years, and Commercial Agent at Toledo for the last year.

—Mr. Benjamin Jeans, who is about to retire from the service of the Great Western Railway of England, has been a guard on the trains of that company for 53 years. Since 1854 he has been on one train, the Birkenhead Express, leaving Paddington Station, London, at 1:30 p. m. When Mr. Jeans began his railroad service guards wore guinea beaver hats, and on Sunday they had to wear white trousers. A subscription is being taken to present a testimonial to Mr. Jeans.

—Mr. John C. Eden has been appointed General Freight Agent of the Eastern Minnesota, vice Mr. George O. Summers, who will hereafter devote all his time to the Great Northern. Mr. Archibald Grey, who has been Assistant General Freight Agent for several years and has had charge of Western freight business, has had his headquarters changed from St. Paul to Butte. Mont Mr. Grey will retain his title of Assistant General Freight Agent, but will have charge of the freight department of the Montana Central.

—Mr. H. A. Worcester, Division Superintendent of the Lake Shore & Michigan Southern and a son of the Vice-President of the company, has been transferred from the Lansing to the Detroit Division. He succeeds Mr. Sidney S. Hand, who has been with the Lake Shore Company since 1860, and is now made General Agent at Detroit. Mr. Worcester was Assistant Trainmaster on the Lake Shore road at Buffalo before being made Division Superintendent. Before that time he was a Station Master on the New York Central & Hudson River road, taking that office soon after leaving college.

—Mr. Daniel B. Robinson has been nominated as President of the St. Louis & San Francisco by the Reorganization Committee of that company. Mr. Robinson is now First Vice-President of the Atchison, Topeka & Santa Fe, and has held that office since 1892, having been elected after the death of Mr. Allen Manvel, when Mr. Reinhart became President of the company. Mr. Robinson will remain with the Atchison until about July 1, when it is expected that the St. Louis & San Francisco will be reorganized and the new company in control of the property. The new company will be entirely independent of the Atchison. The bond holdings of the latter company in the St. Louis & San Francisco were sold some time ago to the Reorganization Committee. Its large holdings of stock will be wiped out by foreclosure. Mr. Robinson's career as a railroad man has been frequently told in these columns and needs only be briefly referred to at this time. He became connected with the Mexican Central about 1882, when it was under construction, and became General Manager of the property. He was afterward General Manager of the Atlantic & Pacific for a short period, and then General Manager of the Colorado Midland, taking charge of the construction of that road. He then returned to the Atlantic & Pacific as General Manager, and later became President of the San Antonio & Aransas Pass, holding that office until the road was sold to its present owners. In 1892 he became President of the Santa Fe, Prescott & Phœnix, which was then under construction south of Ashfork, Ariz. This road was built along a route which had been surveyed by Mr. Robinson when he was General Manager of the Atlantic & Pacific. In March, 1893, he became First Vice-President of the Atchison, Topeka & Santa Fe, an office which he has held up to the present time. When the new Atchison company was being organized Mr. Robinson was strongly supported for the presidency of the new company by many members of the Reorganization Committee, which nominated the officers of the new company.

—Mr. Austin Corbin, President of the Long Island Railroad, died on the night of last Thursday at his country place in the New Hampshire mountains near Newport from injuries received by being thrown from his carriage in the afternoon. Mr. Corbin was known to railroad men chiefly through his connection with the Long Island Railroad, of which he had been President for the last 15 years, and his term as President of the Philadelphia & Reading. He was, however, connected with many other enterprises during his long business life. Before entering railroad work, he had become prominent in banking affairs in Iowa and New York City. He was born at Newport, N. H., but in his early manhood went to Iowa, where he soon became a partner in a banking firm. This business grew to be very extensive and profitable and finally Mr. Corbin removed his office to New York City and did a large business in loaning money on Western farm mortgages. He finally organized the Corbin Banking Company to carry on this business. His first railroad interest was in the Indianapolis, Bloomington & Western, which he successfully reorganized, becoming President of the new company. He soon after became interested in the Long Island Railroad, the development of which, with the Manhattan Beach property at Coney Island, had been his chief work of recent years. His first investments in land in Manhattan Beach were about 1873 and in a few years' time he had purchased a large part of the island and began the building of the two great hotels there. The Long Island Railroad at that time was in a bad financial condition and poorly managed, and the lines now operated by the company were owned by many corporations. He secured control of these, improved the service in every way, and within two years the road was taken out of the control of the receivers and placed upon a paying basis. Mr. Corbin's connection with the Philadelphia & Reading began in 1886, and he was President until 1890. He was also one of the Receivers during these years, resigning the Presidency soon after the reorganized company took control of the property. He was also President of the Elmira, Cortlandt & Northern for many years, selling his interest to the Lehigh Valley only a few months ago. He was President of the New England road for a short time in 1892. One of his projects was the establishing of a line of ocean steamers to run between Montauk Point, at the eastern end of Long Island, and Milford Haven, England. Another project that was never carried out was for the connection of New Jersey and Long Island by a tunnel under the North and East Rivers, from Jersey City to Atlantic avenue, Brooklyn.

—Gen. John B. Gray died of Bright's disease, at Asheville, N. C., on June 6, 1896, after a lingering illness.

John Burritt Gray was born at Sheridan, N. Y., June 25, 1831. The beginning of his business career was in New York City, but, on becoming of age, he removed to St. Louis, Mo., where he was engaged in mercantile business for some ten years prior to the war.

During the summer of 1861 he was associated with Generals Lyons, Schofield and Frank P. Blair in organizing and drilling the loyal men of the state of Missouri. In November of that year he went on the staff of General Halleck as Lieutenant-Colonel and Aide-de-Camp, and was assigned to duty with General Schofield. In the summer of 1862 he was commissioned Colonel of the First Regiment of the Missouri State Militia Infantry Volunteers and also Brigadier-General of the Missouri Militia. He served with his regiment and commanded the First Brigade of Davidson's Division, District of Missouri, and was engaged in guarding and keeping open the St. Louis & Iron Mountain Railroad. In the spring of 1863 he became Adjutant-General of Missouri, which office he held until the close of the war.

At the close of the war, General Gray presented to Congress the claim of the state of Missouri for reimbursement of moneys expended on behalf of the United States, in supporting troops, and, after two years' work, succeeded in collecting and paying into the State Treasury about $7,000,000, in settlement of that claim. In 1867 he was offered the appointment of Postmaster of St. Louis by President Johnson, and later the position of Auditor for the Treasury Department by President Grant, whose personal acquaintance and friendship he enjoyed. Both of these appointments he declined.

In 1880 he became connected with the American Brake Company, of St Louis, of which he was President for several years. Under his management, the buffer brake of the American Company was developed. With a keen business instinct, he was one of the first to see and admit the futility of further attempts with the buffer brake, after the Burlington brake trials of 1886-7, in which the American Brake Company was a competitor. Thereafter, he bent his energies to the development of the outside equalized driver brake business of the American Company. He removed his headquarters from St. Louis to New York in 1885, withdrawing from the Presidency of the company, and taking the position of Vice-President, which he continued to occupy until his death. In 1888 he was instrumental in effecting a lease of the American Brake Company to the Westinghouse Air-Brake Company, and has since that time had general charge of the Eastern business of the driver brake department of the Westinghouse Air-Brake Co.

During the past two years his health has been continually declining. Last summer he went abroad for several months, and shortly after his return he went to Asheville, N. C., where, the climate seeming to benefit him, he purchased property and began building a home, which was not quite completed at the time of his death.

ELECTIONS AND APPOINTMENTS.

Augusta Southern.—Charles W. Jackson, previously Traveling Freight and Passenger Agent, has been appointed General Freight and Passenger Agent. Morgan Richards, previously Claim Agent, has been appointed Assistant General Freight and Passenger Agent.

Baltimore & Ohio.—Mr. H. A. Laing has been appointed Commercial Freight Agent, at Kansas City, Mo.

Baltimore & Potomac.—At the annual meeting of the stockholders held last week directors were elected as follows: Frank Thomson and R. D. Barclay, of Philadelphia; John Cassels, of Washington, D. C.; Samuel Cox, Jr., of Charles County; Robert C. Hall, Michael Jenkins and J. B. Ramsay, of Baltimore. The following officers were re-elected: President, B. F. Newcomer. Vice Presidents, Frank Thomson and Gen. Wm. Sewell of Camden, N. J.; Secretary, James P. Kerr, of Baltimore, and Treasurer, Robert W. Smith, of Philadelphia.

Boise, Nampa & Owyhee.—This new Idaho company was organized at Boise, Idaho, last week by the election of the following directors and officers: W. H. Dewey, President; John E. Stearns, Vice-President; R. E. Greene, Secretary and Treasurer; W. E. Borah, Attorney; J. M. Goffey, of Pittsburgh; Robert N. Marian, of Jamestown, N. Y., and E. H. Dewey.

Canada Southern.—The annual general meeting was held at St. Thomas, Ont., on June 3. The following were elected officers: Cornelius Vanderbilt, William K. Vanderbilt, James Tillinghast, Chauncey M. Depew, Charles F. Cox, Samuel F. Barger, Joseph E. Brown, Edward R. Wicke and Nichol Kingsmill.

Chicago & Eastern Illinois.—At the annual meeting at Chicago, June 4, all the old directors were re-elected, and the following officers chosen: H. H. Porter, Chairman of the Board; M. J. Carpenter, President; O. S. Lyford, Vice-President; C. W. Hillard, Second Vice-President and Treasurer; H. A. Rubidge, Secretary; H. J. Messing, Assistant Secretary, and A. R. Flower, Assistant Treasurer, New York City. Executive Committee: H. H. Porter, M. J. Carpenter, O. S. Lyford, C. W. Hillard, Henry Seibert.

Chicago & Northwestern.—The annual meeting of the stockholders was held at Chicago, June 4. The following were chosen directors for three years: Byron L. Smith, Cyrus H. McCormick, F. W. Vanderbilt, W. K. Vanderbilt, H. McK. Twombley and John I. Blair. The officers elected were: Chairman of the Board, Albert Keep; President, Marvin Hughitt; Vice-President, Treasurer and Secretary, M. L. Sykes, New York; Assistant Secretaries and Treasurers, S. O. Howe, New York; J. B. Redfield, Chicago.

Chicago & Western Indiana.—Stockholders of the Western Indiana and Belt Railway Companies held their annual meeting at Dearborn Station, Chicago, June 30. The following were elected Directors for the ensuing year, and all of them were present at the meeting: Charles M. Hayes, Grand Trunk; James Ramsey, Jr., Wabash; O. S. Lyford, Chicago & Eastern Illinois; W. H. McDoel, Louisville, New Albany & Chicago; D. B. Robinson, Atchison, Topeka & Santa Fe; A. M. Tucker, Chicago & Erie. James Ramsey takes the place of C. M. Hayes as the representative of the Wabash, and C. M. Hayes succeeds W. J. Spicer as the representative of the Grand Trunk. Benjamin Thomas was elected President of both the Western Indiana and Belt line; M. J. Clark, Secretary, and J. E. Murphy, Treasurer.

Chicago, Rock Island & Pacific.—The annual meeting of the stockholders was held June 3. F. H. Griggs, of Davenport, Ia., was elected a Director to succeed the late Judge Wright, of Des Moines. The Directors whose terms expired were re-elected. Subsequently the Directors elected the following officers: President, R. R. Cable; First Vice-President, Benjamin Brewster, New York; Second Vice-President, Treasurer and Secretary, W. C. Purdy; Third Vice-President, W. S. Truesdale and George T. Boggs, Assistant Treasurer and Secretary at New York City.

Chicago, St. Paul, Minneapolis & Omaha.—The annual meeting of the stockholders was held at Hudson, Wis., June 6. Marvin Hughitt, W. W. Winter, D. P. Kimball, Byron L. Smith and Chauncey M. Depew were elected Directors for three years, and the following officers were re-elected: President, M. Hughitt; Vice-President, Treasurer and Assistant Secretary, M. L. Sykes; Assistant Treasurer, S. O. Howe; Local Treasurer at St. Paul, C. P. Nash; Secretary, E. E. Woodman.

Duluth & Iron Range.—A. M. Smith having resigned position to accept service with another company, the office of Assistant Superintendent has been abolished.

Erie.—Vice-President Merrill has rearranged the divisions for operation. The entire line between New York and Chicago is now divided into two operating divisions. East of Salamanca and Dunkirk, N. Y., the line is known as the Erie division, and west of these points the Ohio division. The latter is subdivided into the Meadville division, extending from Meadville to Kent, and also includes the Franklin branch. The Cincinnati division, Kent to Dayton, O., and the Mahoning; the Lima division, Marion to Huntington, and the Chicago division, Huntington, Ind., to Chicago.

The last two named divisions were formerly known as the Eastern and Western divisions of the Chicago & Erie. The Meadville division was formerly the first and second divisions of the N. Y., P. & O., and the present Cincinnati division was the third and fourth divisions of the N. Y., P. & O.

Grand Trunk.—John Disay, of Wiarton, Ont., who has been Division Roadmaster for many years, has resigned, and an American named Piper has been appointed to the vacant position.

Louisville, Evansville & St. Louis.—The appointments and changes made by Receiver G. T. Jarvis, and noted from week to week, in these columns, as made, are summarized below for convenience. The offices of General Superintendent, General Road Master and Master Car Builder have been abolished. Mr. J. R. Sample has been appointed Superintendent, in charge of the Transportation Department; office at Princeton, Ind. Mr. T. A. Allen, Chief Engineer, assumes charge of the Maintenance of Way Department, in addition to his present duties; office at Evansville, Ind. Mr. J. F. Sechler, Master Mechanic, assumes charge of the Car Department, in addition to his present duties; office at Princeton. Mr. C. W. McGuire, Auditor, is also appointed Car Accountant, vice Mr. J. C. Dierking, resigned; office at Evansville. Mr. A. R. Candy has been appointed Store Keeper, vice Mr. F. S. Way, resigned; office at Princeton. Heads of department report direct to Geo. T. Jarvis, Receiver and General Manager.

Marion & Rye Valley.—George C. Landis, Manager of the Rye Valley Mining Co., has also been made Manager of the Marion & Rye Valley Railroad and Mining Co., at Marion, Va.

Minneapolis, St. Paul & Sault Ste. Marie.—The stockholders held their annual meeting in Minneapolis on June 2. The old Board of Directors was re-elected, with the addition of R. B. Angus, of Montreal, and a heavy stockholder in the Canadian Pacific, who was elected to fill the vacancy caused by the death of R. B. Langdon. The board elected is as follows: Thomas Lowry, John Martin, W. D. Washburn, J. S. Pillsbury, W. C. Van Horne, Thomas G. Shaughnessy, C. H. Pettit, F. H. Peavy, William B. Dean, W. H. Bradley and R. B. Angus.

Oregon Central & Eastern.—C. Sullivan has been appointed Acting Superintendent, vice Charles Clark, previously Superintendent.

Ottawa & Gatineau.—W. Dale Harris having resigned the position of Managing Director of this company, P. W. Resseman, General Superintendent, will assume all the duties pertaining to that position and report direct to the President.

St. Louis & O'Fallon.—The incorporators named in the charter filed in Illinois last week are as follows: Edward L. Thomas, John T. Taylor and William A. Reiss, all of Belleville, Ill.; John Voght, Rebs Station, and Ellis Taylor, of Lenz Station, St. Clair County, Ill.

Southern.—The line between Atlanta and Brunswick Ga., including Hawkinsville Branch, has been designated as the Eighth Division, with W. R. Beauprie as Superintendent, with office at Macon, Ga. The Fifth Division now comprises the lines between Atlanta and Cleveland, Austell and Birmingham, Cohutta and Ooltewah Junction, Rome and Attalla, Atlanta and Fort Valley, with J. H. Barrett as Superintendent, with office at Atlanta, Ga.

Southern California.—J. J. Byrne, General Passenger Agent, has been appointed Auditor as well, succeeding in the latter office Mr. H. C. Whitehead, who has recently been chosen General Auditor of the Atchison, Topeka & Santa Fe.

Woodstock & Centerville.—This new company in New Brunswick has elected directors as follows: Patrick O'Mullen, Halifax; Geo. W. White, W. F. Drysdale, Woodstock, N. B.; R. W. Connor, St. John; Bernard Mahon and T. W. Smith, New York.

Yankton & Norfolk.—A new company has been formed to build this road, with the following incorporators: John M. Dougherty, Samuel H. Stearns, B. J. Scannell, Louis Schroeder, B. L. Baldwin, A. C. Kennedy and James P. English, of Omaha. They have elected the following officers: President, James P. English; Vice-President, B. L. Baldwin; Secretary, B. J. Scannell; Treasurer, Louis Schroeder.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Baltimore & Ohio.—The agreement of merger with the York Southern will be followed by the standard gaging of this line between Baltimore and the Pennsylvania state line. The alignment of the road will also be improved and a number of curves taken out. Many of the large wooden trestles over which the tracks run will be filled in and steel bridges or stone arches built to span those not filled.

Butler & Pittsburgh.—Two routes are still being considered for this proposed road to Lake Erie. From Butler to Millerstown, on Bull Creek, only one survey has been made. From this point the new line diverges from the former survey, and, instead of running down Deer Creek, follows Bull Creek to its mouth below Tarentum, crosses the Allegheny at an elevation of 80 ft. above the river and 35 ft. above the West Penn and Allegheny Valley tracks. This will bring the road through New Kensington, from which it will run southeasterly to a point where there are three slightly different lines to avoid tunnels, all running in nearly a direct line to Milltown at the headwaters of Plum Creek. There it joins the old or Deer Creek route. Chairman James H. Reed said that the new route, although longer, would not cost so much to build.

Centralia & Chester.—Track is being laid on the extension from Centralia to Salem, Ill., 14 miles, and it is expected to run trains to Salem by June 15, after which work will be commenced on an extension from Evansville, Ill., to St. Genevieve on the Mississippi River, about ten miles. The company has a close running arrangement with the Illinois Central at Centralia, using the latter's terminals at that point. At Salem the Chicago, Paducah & Memphis gives another outlet to Chicago via the Wabash and an Eastern connection is made with the Baltimore & Ohio Southwestern.

Cincinnati, Portsmouth & Virginia.—President Samuel Hunt states that important improvements to the roadbed are to be made this season. The plans of the company contemplate the expenditure of about $250,000 this year in improvements. The grade will be reduced at various points on the line, and the maximum new grade will be one per cent. To obtain this grade important cuts and fills will be necessary, requiring about 150,000 sq. yds. of excavation. The heaviest cuts will be made on the nine miles north of Cincinnati to Batavia Junction. It is estimated that the work to be done about Batavia will cost nearly $100,000. The work of reducing grades and eliminating curvatures at that point will involve a practical rebuilding of five miles of road. A new station of stone and pressed bricks costing $2,000 will be put up at Batavia. Many of the old wooden trestles will be filled in, and others will be replaced by metal structures. Two trestles, one 59 ft. high and 350 ft. long and another 40 ft. high and 200 ft. long, are now completed. New rails will be laid on practically the entire line of 112 miles. The curvature of the road will also be improved.

Kansas City, Pittsburgh & Gulf.—That portion of the Texarkana & Fort Smith Division of this road from Beaumont south to Port Arthur, Tex., on the Gulf coast, was turned over to the company on June 1, when regular trains began running.

The contract for the first 30 miles of this division, from Beaumont north, has been let to a contractor named Lendley, and work on this contract has been begun at Beaumont. This division is to connect with the line being built south of Shreveport, La., by the Kansas City, Shreveport & Gulf Company.

With this and other contracts let during the past month all the work south of Shreveport La., is now under contract and construction work is going on rapidly. The tracklaying on some sections is being done by a Harris tracklaying machine, and two miles of track has been laid in one day on this division of the road. Tracklaying is also going on near the state line between the Indian Territory and Arkansas on the division north of Shreveport. The Chief Engineer, Mr. R. B. Gillham, expects to put down 300 miles of track by Jan. 1, which includes completing the road from Shreveport to Port Arthur and also the connection between Horatio and Mena City in Arkansas. This will give a continuous line from Kansas City to Port Arthur of 769 miles.

There has been already a very great development along the route of the roads. In the lumber regions, the mills have gone into the woods and have piled up many thousands of feet of lumber in advance of the building of the road. In the mining regions of Arkansas, numerous mines have been started in view of the building of the road, mining lead and zinc, including manganese, which are found in Arkansas.

Lake Dauphin Colonization.—D. D. Mann, of Montreal, who has the contract for building about 250 miles of the road north of Gladstone, northwest of Portage la Prairie, Man., expects to have all the sub-contracts awarded by next week. Work will be started from Gladstone immediately and it is expected to complete nearly 100 miles of the grading before the winter months. The terminus of the present contract is a point on Lake Winnepegosis.

Long Island.—The officers have made an agreement with the property owners along the route of the proposed extension to Port Washington, at the extreme easterly end of Long Island, to extend the line to that point this season, if free right of way is secured for the line. A fund sufficient to buy the right of way under condemnation proceedings has now been raised and the construction of the road will probably be commenced this month. The condemnation of the few pieces of property over which free right of way could not be secured will not delay the work. The extension will be about five miles long from the present Great Neck station across the head of Manhasset Bay to its terminus. A separate company has been organized this year by officers of the Long Island road, which will build the new line. The grading and tracklaying is expected to be done within three months.

Mexican Central.—The company has laid 17 miles of track this year in the State of Jalisco, on the line between Guadalajara and Ameca, Mex. The total length of this line is 55 miles. The company has located a line from Lerdo to San Pedro, a distance of 40 miles through the Laguna country, which is a very rich cotton district. The contract has been let to Joseph H. Hampson, who commenced work June 1. This work is in the States of Durango and Coahuila. A locating party is also working in the State of Chihuahua.

New Roads.—A new road has been projected from Rugby, Tenn., to Butler's Landing, on the Cumberland River. The company has been incorporated by John Condon, of Knoxville, Tenn.; Robert Walton, agent of the Rugby (Tenn.) Land Co.; James Baker, of Huntsville, Ala.; A. McDonald, of Glen Mary, and J. Butler, of the Forest Oil Co. The new road will connect with the Cincinnati Southern at Rugby road, touch Jamestown, in Fentress County; Livingstone, the county seat of Overton County, reaching Butler's Landing, thus giving a water outlet to Nashville.

Norfolk, Virginia Beach & Southern.—The new owners of this road, formerly the Norfolk, Albemarle & Atlantic, sold under foreclosure this year, propose to change the gage of the road from 3 ft. to standard. The company now operates 18 miles of road from Norfolk to the Atlantic coast, at Virginia Beach, and owns a hotel at that point. A short extension is also to be built to Knott's Island, at Currituck Sound.

Pennsylvania.—The company has awarded the contract for grading a branch road near Frugality to J. S. Vipond, and for the construction of a stone bridge on the same line to W. G. Stahl & Sons, of Altoona, Pa. The branch will be about one mile in length, and will extend to a coal field now being developed by the Frugality Coal & Coke Co., of which P. H. Walls is Manager.

A right-of-way agent of this company is said to have recently gone over the route for a branch to Ocean City, Md. The new road, if built, would start from Berlin, on the Maryland and Delaware line and about six miles from Ocean City. The construction of this line would give an all-rail route from Baltimore and Washington to Ocean City, on the Atlantic coast.

The company has invited bids for the construction of nine miles of road from Cherry Tree, Pa., northward and down the Susquehanna River to Burnside. The new road will be known as the Cherry Tree branch of the Cambria & Clearfield.

Philadelphia, Bustleton & Trenton.—The grading on this branch of the Pennsylvania, from its junction with the New York Division, a short distance east of North Penn Junction, to the Oxford turnpike, its present terminus, is completed. The track is now being laid and is expected to be finished in a few months. There are several streams to bridge and a number of overhead cross bridges to erect. This will require about two months. Five streets will be carried over the railroad.

Rio Grande Western.—The Sevier Valley Branch was opened for Traffic on June 1 as far as Richfield, Utah. This is about 18 miles south of the former terminus at Salina. The road is being extended further south and it is thought will reach Marysville this year.

St. Louis, Siloam & Southern.—President H. D. Mackey, of St. Louis, tells the newspapers at St. Louis that he has arranged in the East for funds to build this road. It is projected from St. Louis, to Fort Smith, Ark., and he gives the distance between these points by the route adopted as 211 miles, as compared with a route via the St. Louis & San Francisco, of 416 miles, and over the Iron Mountain via Little Rock, of 511 miles. The new road is to extend southwesterly from St. Louis, through Siloam Springs, near Pomona, in Howell County; Gainesville, seat of Ozark County; Harrison, seat of Boone County, to Van Buren and Fort Smith, Ark. Ex-Gov. Fishback, of Little Rock, Ark., is a vice-president of the company, which was incorporated last October.

Spartanburg & Henrietta.—Active work has already begun on an extension of this new road from Spartanburg to Glen Springs, S. C. The work is being done by a private firm, the Simpson Brothers, who say the grading will be completed and the track laid to the hotel at Glen Springs by July 1.

Spokane Falls & Northern.—The branch to the Trail Creek mining region in British Columbia is now under construction to be finished early in the fall. The line is about 15 miles long from Northport, Wash., the present northern terminus of this road. A bridge will be built across the Columbia River near Northport. The branch is being built under the charter title of the Columbia & Red Mountain, which has charters in Washington and British Columbia. The terminus of the road will be at the town of Rossland, British Columbia, in the center of the Trail Creek gold mining district. A smelter is now under contract to be built at Northport, and where the ore of the Trail Creek district will hereafter be treated. The Trail Creek tonnage at present is estimated to be about 300 tons daily. A merger of the new road with this company and the Nelson & Fort Sheppard will be effected later, making a system of 215 miles, beginning at Spokane Falls, Wash., and terminating at Rossland, British Columbia, and the town of Nelson, British Columbia, at which point connnection is made with boats on the waters of the West Kootenai district.

Texas Central.—Local newspapers report that engineers of the railroad have recently returned from a trip from Albany, Tex., the present Western terminus, to a point near the border of New Mexico. The engineers surveyed a line for the western extension to New Mexico through the region of Texas lying between the Fort Worth & Denver City and the Texas Pacific roads. There is little chance of the company building on any part of this route.

Toledo & Ohio Central.—The company is putting in the track about 1,000 lbs. of new 70-lb. rails. When these rails have been laid new track will have been put in all the way from Toledo south to Corning, 185 miles. On the Western line of the company the road is being reballasted from Toledo south to Columbus, O., 130 miles.

Wheeling & Lake Erie.—The company is preparing to make extensive improvements to the roadbed this year, and is now putting in the track about 10 miles of 70-lb. rails, near Massillon. A new rapid coal-loading machine is being built at Toledo, which will be ready this season. The remaining wooden bridges on the line are to be replaced by steel structures, and large sums will be spent in other improvements.

Wilkes-Barre & Northern.—Work on the new road is progressing rapidly north of Dallas, Pa. The engineers have about completed the surveys between Dallas and Harvey's Lake, 20 miles. Reese D. Isaacs has the stonework for the bridges and retaining walls.

Wiscasset & Quebec.—The new officers of this property, whose names were given in the *Railroad Gazette* last week, announce that steps will be taken immediately to resume the construction of the road north of its present terminus and to build various branches. The company now has 43 miles of road completed north of Wiscasset, on the Maine coast. The first line to be built will be 11 miles from Albion, near the northern terminus, to Burnham.

Yankton, Norfolk & Southwestern.—Articles of incorporation were filed last week by a new company organized to complete this road. The directors of the new company are almost all residents of Omaha, Neb., and include John M. Dougherty, Samuel H. Stearns, and others whose names are given in another column. The road is now nearly graded between Aten, Neb., and a point on the Missouri River opposite Yankton, S. D. The project includes a bridge across the Missouri River at the latter place, but this will be built by a separate company. N. D. Miller is Chief Engineer of the bridge company and is now arranging to start work on the structure. The English and local creditors of J. T. M. Pierce, of Yankton, S. D., who projected the road five years ago, are those chiefly interested in the work now being done.

Electric Railroad Construction.

Ashland, Pa.—The Town Council has passed ordinances granting franchises to the Mahanoy Valley Electric Railroad Co. and the Ashland, Centralia & Locust Gap Railroad Co. President Rowe, of the Mahanoy Valley Company, says that construction work will be begun as soon as the Gordon Council grants the right of way.

Baltimore, Md.—President George Blackistone, of the Central Passenger Railway Co., has obtained from the city council a franchise to construct a line on various streets in East and Northeast Baltimore. The City & Suburban Railway Co. offered $20,000 for the franchise, but it was declined.

The Baltimore, Middle River & Sparrows Point Railway Co. has been granted permission to lay tracks from the intersection of Eighth street and Eastern avenue, upon Eighth street to Lombard street, in Baltimore.

Bergen County, N. J.—The Bergen County Traction Co. now operates lines from Pleasant Valley through Fort Lee, Leonia, Nordhoff and Englewood in Bergen County, N. J. It proposes to build a line from Guttenburg to Hackensack, through Ridgefield and Leonia, also to extend the line from Nordhoff and Englewood northward through Cresskill and Closter to Newry. Among the contractors for the construction and equipment of the road are the following: For generators and electric equipment, the General Electric Co.; for the car bodies, the St. Louis Car Co., and Jackson & Sharp Co.; for trucks, the Peckham Motor Truck & Wheel Co.; for rail material, Pennsylvania Steel Co.; for overhead line construction, the White-Crosby Co.; for steel roof trusses, the Berlin Iron Bridge Co.; for engines, the E. P. Allis Co., and for boilers the Heine Safety Boiler Co.

Braddock, Pa.—The Pittsburgh, Braddock & McKeesport Street Railway Co. has been granted permission to build an electric road from Pittsburgh, through Wilkinsburg, Edgewood, Hawkins, Swissvale, Rankin and over a number of streets in Braddock.

Bramwell, W. Va.—The Flat Top Central Electric Supply & Traction Co. has been incorporated with a capital stock of $500,000 to build an electric road between Roseville and Kimball. Among the incorporators are L. E. Tierney, of Powhatan, and H. Bert Wright, of Kyle.

Dedham, Mass.—The stockholders of the Norfolk Central Street Railway Co., which was recently organized with a capital stock of $57,000 to build an electric road from Dedham Centre to Norwood, Walpole and East Walpole, have elected the following officers: President, Francis Doane, of Norwood, Mass.; Treasurer, Thos. T. Robinson, of Dedham.

Chicago, Ill.—About 18 miles of track have been completed on the Englewood & Chicago Electric Street Railroad.

East Wareham, Mass.—Joseph N. Nye, of Fairhaven, Mass., has been granted a franchise to build an electric road from the lines of the East Wareham, Onset Bay & Pt. Independence Railway Co. to Pt. Independence, extending to Agawam, Wareham Narrows and Wareham Centre.

Geneva, Ill.—The Suburban Electric Railway Co. has been incorporated with a capital stock of $250,000 by G. I. Talbot, of De Kalb, Ill., and C. L. McMurray, of Chicago, to build electric roads in Kane, Cook, Du Page and Lake Counties.

Hagerstown, Md.—The Hagerstown Railway Co. has granted a right of way through the lands of the West End Development Co., and the railroad company will ask the City Council for privilege of running over Elizabeth street. By this route connection can be made with the Williamsport extension.

Meaford, Del.—The Sussex Electric Railway Co. has been organized to build an electric road from Lewes to Meaford.

Norwalk, Conn.—Rogers, Baldwin & Vickers, of New York, have been awarded the contract to build the Darien and Westport extensions of the Norwalk Tramway Co.

Pittsburgh, Pa.—The Consolidated Traction Co. of Pittsburgh has purchased a site on Frankstown avenue, opposite Homewood Park, on which it will erect the car barns for the entire consolidated line, with the offices and shops adjoining. The price paid for the ground was about $60,000.

Scranton, Pa.—The Citizens' Street Railway Co., of Lackawanna County, was chartered on June 2, with a capital stock of $200,000, to build 30 miles of road in the streets and suburbs of Scranton. Among the directors are: Wm. L. Connell, President, P. S. Page and Chas. H. Schadt.

Springfield, Vt.—It is stated that the town of Springfield has voted to bond itself for $30,000 toward the building of an electric road between that place and Charlestown, N. H. The estimated cost of construction and equipment is $100,000.

Watertown, Mass.—The West End Street Railroad Co. has petitioned the selectmen of Watertown for authority to build a second track on Main and Mt. Auburn streets to the Cambridge line.

Wellston, Mo.—The Wellston, Creve Cœur & St. Charles Railway Co. has been incorporated to build an electric road from Wellston to St. Charles, with a branch line touching Creve Cœur Lake. The estimated cost of the road is $100,000 and among the incorporators are J. B. C. Lucas, C. P. Damon and J. H. Chambers, of St. Louis.

Worcester, Mass.—A company has been organized with a capital stock of $150,000 to build an electric road from Worcester to Clinton and Fitchburg.

Youngstown, O.—A large force of men are employed in laying the double track from Younstown west to Girard and Niles, a distance of four miles. The single track that has been in operation for a few months between the towns has been crowded with business.

GENERAL RAILROAD NEWS

Baltimore & York.—The proposed consolidation of the York Southern road, in Pennsylvania, and the Baltimore & Lehigh, its southern extension in Maryland, has been finally agreed to and will be effected under the above name. The new company will make a traffic agreement with the Pennsylvania for the use of the latter's terminals in Baltimore. Whether the Pennsylvania has any direct interest in the new company is not clear. This consolidation agreement will reunite two companies which at one time formed one road from Baltimore to York, Pa., a distance of about 90 miles, and called the Maryland Central. The reorganization of the property resulted in the separation of the Baltimore and Pennsylvania divisions on account of conflicting interests among the bondholders of these two divisions. The Pennsylvania Division from Delta, near the Maryland State Line, was reorganized as the York Southern road and changed to standard gage. The line south of the State Line into Baltimore, 43 miles, became the Baltimore & Lehigh. It is still narrow gage, but will be immediately widened.

Boston & Lowell.—At a special stockholders' meeting on June 10 the directors were authorized to issue 20-year four per cent. bonds to the amount of $750,000 to refund a like amount of bonds due on July 1 next. The directors are also authorized to issue bonds for $500,000 bearing four per cent. interest to refund bonds due March 1, 1895.

Central Pacific.—The company has arranged to extend its $3,383,000 first mortgage bonds, maturing July 1 next, one and one-half years from that date, with interest at 5 per cent.

Cheraw & Chester.—This road was sold last week under an order of foreclosure issued by Judge Witherspoon, of Chester County Court. The minimum price named in the order of sale was $25,000, which was bid by the purchasers, Messrs. LeRoy Springs, W. H. Harden, William Ganson, R. C. McManus, and W. T Gregory. Mr. W. H. Harden has been the Receiver of the road for the last two years, while the others above-named are business men of Lancaster, S. C. The new owners will take charge about July 1. The road is 29 miles long and extends from Chester to Lancaster, S. C. The new owners will improve the property and add new equipment.

Chesapeake, Ohio & Southwestern.—In the United States Court, at Louisville, Judge Lurton ordered on June 6 that the railroad be sold within six weeks. The upset price was fixed at $1,500,000. The road is now in a Receiver's hands. It will be bought by the Illinois Central.

Chicago & Eastern Illinois.—The operations for the 10 months ended March 31 show a balance above charges of $510,063, an increase of $361,764 over a year ago. The comparative exhibit follows:

July 1 to April 30.	1895 96.	1894-95	Inc. or dec.
Gross earnings	$3,474,329	$3,124,732	I. $349,597
Oper. Expenses	1,931,250	1,973,091	D. 41,841
Net earn	$1,543,079	$1,151,641	I. $391,438
Other income	123,966	137 444	D. 13,478
Total net income	$1,667,045	$1,289,085	I. $377,960
Fixed charges	1,156,982	1,140,786	I. 16,196
Surplus	$510,063	$148,299	I. $361,764

Chicago & Northwestern.—The preliminary annual report of the company for the year ending May 31, partly estimated for 1896, actual for 1895 and 1894, shows:

	1896.	1895.	1894.
Gross earn	$33,436,344	$28.0 8.374	$31,936,182
Oper. expen. and charges.	28 328 545	25,501,326	27,678,6 8
Net earn	$5,107,798	$2,607,048	$4,307,541
Other income	257,909	244,907	
Total	$5,364,707	$2,851,955	$4,307,543
Div. on prefd	1,263,975	1,563,450	1,563,450
Div. on com	$1,953,082	$1,562,096	$2,343,144
Surplus	$1,848,649 (Def.)	$273,590 (Sur.)	$400,949

Houston, East & West Texas.—Blair & Co., bankers of New York City, have secured control of this road through the purchase of the outstanding stock and of a majority of the bonds. It is expected that they will take formal possession of the road this month. Almost all the securities of the company were owned by its former President, Mr. E. S. Jemison, and since his death the future of the road has been uncertain. It extends from Houston to the Sabine River at Logansport, La., 192 miles, and operates the Logansport & Shreveport road, which extends to Shreveport, La., 40 miles further east. The line was made standard gage in 1894.

Maryland, Waterbury & Connecticut River.—Judge A. Heaton Robinson, of New Haven, and one of the counsel of the New York, New Haven & Hartford, who purchased this road at the recent foreclosure sale, states in an interview that the property, contrary to general reports, was not purchased for the New York, New Haven & Hartford road. He declines to make public the names of the present owners of the property. He states that the future of the road has not yet been determined upon. It will be equipped with electricity or else abandoned, as its continued operation by steam would not be profitable.

Missouri, Kansas & Texas.—At the recent directors' meeting at Parsons, Tex., it was voted to increase the capital stock $5,450,000, the new stock to be issued in exchange for the capital stock of subsidiary railroad corporations in the Missouri, Kansas & Texas system. These are the Southwestern Mineral, in Kansas, with a capital stock of $600,000; the St. Louis, Kansas City & Eastern, in Missouri, with a capital stock of $350,000, and the Missouri, Kansas & Eastern which owns the new St. Louis line, with a capital stock of $4,500,000.

Norfolk & Western.—The Reorganization Committee announces that over 97¾ per cent. of all the disturbed bonds of all classes, and over 87 per cent. of the stocks of the company having been deposited under the plan, further deposits will not be received after June 15, except in the discretion of the committee, and on such terms as it may impose.

Northern Pacific.—Earnings for April are reported as follows:

	1896.	1895.	1894.
Gross earn	$1,284,493	$1,307,734	$1,117,387
Oper. exp.	969,631	848,820	901,216
Net earn	$374,832	$458,914	$216,141
Prop. exp. to earn.	70⅞	61⅞	80¾
Net 19 mos	7 322,701	5,452,527	

St. Lawrence & Adirondack.—A special meeting of the stockholders has been called for June 13 at Montreal to vote for the issue of new five per cent. bonds to the amount of $800,000 to retire the same amount of the present outstanding first mortgage bonds; and to issue second mortgage bonds to the amount of $400,000.

St. Louis & San Francisco.—The Reorganization Committee announces that over 95 per cent. of the total issue of 4 per cent. consolidated bonds having been deposited, the plan has been declared operative. The right to subscribe to the new securities has lapsed, but bonds may be deposited without further penalty until June 20.

St. Louis, Kennett & Southern.—Col. S. W. Fordyce, President of the St. Louis Southwestern, has been appointed Receiver by the United States Circuit Court at St. Louis, and is now in possession of the road. It is 45 miles long in the extreme southeastern portion of Missouri from Caruthersville to Campbell. The equipment of the company consists of but two locomotives and 30 cars. The road was built a few years ago by Louis B. Houck, of St. Louis. The officers of the company have been involved in litigation for a long time past. Colonel Fordyce early in the year was appointed Receiver under the order of a state court in a suit brought by A. J. Kerfott, one of the chief stockholders and formerly General Manager. This appointment was opposed by the interest represented by L. B. Houck, the President, and Mr. Houck was appointed Receiver by another state court and refused to give the possession of the road to Colonel Fordyce, until the latter's officers finally took forcible possession of the property. The appointment of Colonel Fordyce as Receiver by the state court, however, was not sustained on appeal, but immediately upon this decision being announced his appointment was secured in a suit in the United States Caurt.

West Jersey & Seashore.—The Pennsylvania railroad is organizing a surveying party under J. U. Crawford, engineer of branch lines, to make a full and complete resurvey of all the lines of this company, and to prepare a correct map of these lines. This work, which will be commenced in about a week, is expected to require a year or more to complete.

Electric Railroad News.

Auburn, N. Y.—The increase of the capital stock of the Auburn City Railway Co. to $300,000 has been approved by the State Board of Railroad Commissioners.

Hanover, Mass.—The Hanover Street Railway Co. will increase its stock to $50,000.

Lewiston, N. Y.—The Lewiston & Youngstown. Frontier Railroad Co. has been authorized to increase its capital stock to $150,000.

Ottawa, Ill.—The Ottawa Electric Street Railroad, which has been idle for about two years, was purchased on June 1, by J. McMillan Smith, of South Bend, who will put it in repair and operate it within 60 days.

San Jose, Cal.—Henry B. Alvord and John W. Findlay have been appointed Receivers for the First Street Railway Co. The road was incorporated in 1894, but none of the principal or interest on the mortgage indebtedness has ever been paid.

TRAFFIC.

Traffic Notes.

Two New Orleans ticket brokers were convicted of forgery in New York City this week, their crime being the attempt to use spurious passes on the Southern Pacific.

The Southwestern Traffic Association has made a rate of $1.55 per 100 lbs. on sugar in carloads from Galveston to the principal points in Montana. The New York agents of the lines in this Association have been organized into a committee for the purpose of making recommendations to the Board of Administration.

Many ship loads of grain have been taken from New York within the past few weeks to Cape Town, Delagoa Bay and other ports in South Africa, and the reporters think that it is for the British army. One vessel, the American, heretofore carrying cotton from New Orleans to Liverpool, took a load of over 11,000 tons.

The Norfolk & Western has issued a new freight tariff from New York to the West, on the basis of 59 cents, first-class, to Chicago. These rates are 10 cents lower (first-class) than the all rail rates from New York, and 7 cents higher than the rail and lake rate. It is said that the managers of the Joint Traffic Association will authorize the Chesapeake & Ohio to meet the Norfolk & Western rates, which are a reduction of 6 cents (first-class) from those heretofore in effect.

The United States Circuit Court of Appeals, at New Orleans, has decided in favor of the railroads in the long pending case of the Board of Trade of Troy, Ala., which was decided by the Interstate Commerce Commission in favor of the city, in August, 1893 as reported in the *Railroad Gazette* of that year, page 680. The present decision holds that Montgomery has so much larger volume of business and has so much greater advantage by reason of water competition that the dissimilarity of the conditions relieves the railroads from the duty of complying with the long and short haul section of the Interstate Commerce law. This affirms a similar decision by the lower court.

The hearing given by the Interstate Commerce Commission, at Kansas City, last week, was held by Commissioner Morrison alone. The report of the St. Louis *Globe-Democrat* says that the original complaint of rate discrimination against certain points in Kansas on shipments to the Gulf, has been lost sight of, and the fight appears to be between certain railroads in which an effort is being made to fix a charge of rate manipulation on the Chicago-Great Western and the Missouri Pacific. F. M. Baker, of Atchison, stated that for a long time he had been paid a commission of from two cents to five cents a bushel on grain sent through his elevator, and Benton Bros., of Leavenworth, stated the same thing, and added that since the investigation was announced the commissions had ceased, but they were given the rent of the Missouri Pacific elevator free. The hearing was adjourned until July 6, when the entire Commission will return to Kansas City to complete it. St. Louis, Omaha and Galveston parties have asked to be heard.

Chicago Traffic Matters.

CHICAGO, June 10, 1896.

It is understood that the action of the Board of Managers in disapproving three cheap-rate excursions to Niagara Falls from Indiana and Ohio points does not mean that all such excursions are to be cut off, and the Central Passenger Committee has authorized the Erie and several other lines to run excursions to the Falls from Cincinnati and other points at rates just 100 per cent. higher than those of last year. Of course this action will have to be approved by the Board of Managers before the excursions can be run.

The scheme to have Chairman Caldwell redeem the covers of all 2,000-mile books will be of great benefit to the Western lines. The time for the redemption of old tickets expired June 5, and thousands of the tickets have been taken up from scalpers and others. The brokers are completely blocked and many of those who dealt in no other form of ticket will be forced out of business. This means that a majority of the manipulators will succumb, as there is little profit in any other kind of scalping.

To head off manipulation of round-trip excursion tickets to the national political conventions, the Western roads will reduce the one-way rates. During the Democratic convention a rate of $7 will be in effect between Chicago and Kansas City, Leavenworth, Atchison and St. Joseph. For the Republican convention the rate between St. Louis and Kansas City will be $4.50; between St. Louis and Atchison or St. Joseph $5.65. Between St. Louis and Chicago the rate will be $4.25 for both conventions.

The Santa Fe has put on a fast train between Chicago and Kansas City for mail and express. The train leaves Chicago at 1 a. m., making the run in 13 hours. It has one or two passenger cars. This train, in connection with that over the Erie, gives the Wells-Fargo Company a quick service between New York and Kansas City, and will deliver express matter 24 hours earlier in the Southwest.

To meet the competition of electric street cars the Chicago & Northern Pacific has reduced its rates between all suburban stations and Grand Central station, Chicago, to five cents. This road traverses a thickly settled district. The Chicago & Northwestern, its only steam competitor, says it will make no reductions.

The following tables show the receipts and shipments of live stock at the Union Stock Yards, Chicago, with the number of carloads carried by each road, during the month of May:

RECEIPTS.

Roads.	1895.	1896
Santa Fe	1.096	924
Chicago & Alton	1 795	2,051
Burlington	4.754	6,02?
Milwaukee & St. Paul	2 753	2 877
Northwestern	3,249	4,51?
Rock Island	2,524	2,351
Great Western	558	66
Illinois Central	2,168	1 888
Wabash	1,519	1,071
Other lines	1,154	96?
Totals	21,570	23,327
Increase		1,757

SHIPMENTS.

Roads.	1895.	1896.
Baltimore & Ohio	258	280
Erie	1,123	1,243
Chicago & Grand Trunk	1,791	1,851
Lake Shore & Mich. South	343	833
Michigan Central	724	573
New York, Chic. & St. Louis	134	279
Pitts., Cin., Chic. & St. Louis	43	32
Pitts., Ft. Wayne & Chic	684	467
Other lines	442	474
Totals	5,542	6,032
Increase		490

Peace has again been restored with the Car Ferry. The Chicago Great Western has agreed with the other roads to allow the "ferry" a differential (5 cents on first class and 1 cent on fifth class; no differential on the lower five classes). This agreement ends Aug. 15 and if the ferry takes a lower differential before that time it is to be met by the Great Western. The ferry has advanced its rates to within 7 cents of the all-rail rates.

Eastbound shipments by lake last week amounted to 83,164 tons, of which 78,737 tons were grain. Total rail shipments to the East last week, exclusive of live stock, amounted to 64,108 tons, compared with 40,311 tons for the previous week, an increase of 13,797 tons, and against 51,718 tons for the corresponding week of last year. The proportions carried by each road were as follows:

Roads.	WEEK TO JUNE 7.		WEEK TO MAY 30.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	6,094	9 4	3,016	7.5
Wabash	6,883	10.7	4,884	12.1
Lake Shore & Mich. South.	9,317	14.5	5,574	13.8
Pitts., Ft. Wayne & Chicago	7,962	12.4	5,331	13.2
Pitts., Cin., Chi. & St. Louis.	7,937	12.4	5,046	12.5
Baltimore & Ohio	4,729	7.4	2,944	7.3
Chicago & Grand Trunk	7,283	11.4	5,286	13.1
New York, Chic. & St. Louis	6 244	9.8	3,588	8.9
Erie	5,017	7.8	3,089	7.7
C., C., C. & St. Louis	2,662	4.2	1,553	3.9
Totals	64,108	100.0	40,311	100.0

Of the above shipments 3,096 tons were flour, 22,065 tons grain, 13,877 tons provisions, 11,565 tons dressed beef, 3,139 tons butter, 1,628 tons hides, and 5,821 tons lumber.